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QUANTITATIVE ASPECTS OF THE ECONOMIC GROWTH OF NATIONS

I. Levels and Variability of Rates of Growth

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PREFACE

This journal, which on several previous occasions has introduced innovations, is again attempting in this issue a new experiment. Rather than including five or six articles on different subjects, the entire issue is devoted to a single essay. There are several reasons which induced us to try this new procedure. Above all, Professor Kuznets, the author of the essay presented here, is a man of national and international reputation. His name and his manifold contributions to the study of economic growth are known not only among economists, but social scientists in other fields. Moreover, the nature of his contribution extends well beyond purely economic analysis and reaches over into politics, social relations, and history. Finally, the scope of the essay presented here is so large that any curtailment would have seriously detracted from its overall value.

We considered first dividing the essay in two parts and publishing it in subsequent issues of this journal. After some reflection we rejected this alternative for the simple reason that the supporting tables in the Appendix, if separated out, would have made dull reading by themselves, and that, at the same time, the main body of the article without the supporting tables of the Appendix would have suffered from the absence of the primary data on which are based the reasoning and analysis contained in it. Since the various parts of the essay were "inseparable", we decided that the only alternative open was to include the entire work with the Appendix and the supporting tables of "raw" data.

We hope that our decision will find general approval. Although the reader who is accustomed to being offered "variegated fare" in any issue of a journal such as ours, the importance of the essay presented here justifies the abandonment of this policy in this case. We consider this essay to be one of the pathbreaking contributions in the study of economic growth. Not only does it assemble a vast amount of material, but it organizes this material in a form which, we believe, will exert a lasting effect upon the study of long-run economic growth. This essay, therefore, is destined to become a focus of reference for future researchers in the field and we expect that the quantitative series reported in it will form a substantial part of the empirical basis upon which are built future studies of growth patterns. For this reason we thought that it was important to present not only the aggregates or refined data presented by Professor Kuznets in the main article, but also the raw data from which these aggregates and refinements are derived. Although this is a single issue of a scholarly journal, we expect that it will, in due time, become a primer--perhaps in pamphlet form--for all those interested in the empirical study of secular economic development.

We are delighted to be able to inform our readers that the essay included in this issue is the first of a series of related papers which Professor Kuznets plans to publish in our pages. We are confident that in the course of the next months we will be able to bring to our readers these subsequent articles on related topics. We are persuaded that these essays, in their totality, will form a new fundamental work in the quantitative study of long-run economic growth.

THE EDITOR

I. Introduction*

This paper, and others to follow, result from an attempt to study the quantitative characteristics of economic growth--largely by using long-term series of national product and its components for a number of countries. The present paper deals with levels of and changes over time in the over-all rates of growth of population, national product, and product per capita. In other papers we plan to deal with long-term trends in the industrial distributions of national product and the labor force; in the distribution of product by type of use--and thus also in the structure of flow of goods to consumers and of capital formation; in the apportionment of national income among economic groups; and in the relative importance of foreign trade and other movements across the boundaries.

In view of the conceptual problems in national income estimation, the errors in the estimates, and the paucity of long-term series, such an attempt may seem foolhardy--or at least, ill-judged. In particular, the aggregation in countrywide totals may, by submerging all detail, conceal the very events and conditions that might be most illuminating. And one can agree with students of social change who are impressed by the variety and specificity of historical events that form its stream and see little use in statistical totals, which necessarily reduce many-sided reality to uniform figures and which reflect, in unknown degree, the dubious assumptions wherewith such reduction is accomplished.

The legitimacy of these doubts and qualms is granted. And yet economic growth is a process whose basic characteristics are quantitative--whether we think of the over-all magnitudes or the distinctive parts of the unit whose growth we study. Reduction to some measurement basis is, therefore, inescapable. It is surely preferable to qualitative statements like "waxing and waning of opulence," "lasting prosperity and vigorous development," and "persistent misery and stagnation." Second, granted that such measurement would be most helpful if applied to and available separately for the thousands of economic units that comprise a nation, for obvious reasons such fully articulated data are not procurable--the usual experience being a stock of varying coverage for different parts of a country's economy. Yet in dealing with the economic growth of a nation, we must have comprehensive measures if only to avoid the common pitfalls of particularistic study, where uncertainly weighted details are combined somehow into untestable general statements. Third, a variety of countries and periods should be included in the study of economic growth if some general characteristics are to be found and tested. The difficulties in dealing with uncoordinated and variegated partial data are bad enough if a general set of measures is sought for a single country; they become impassable obstacles in any attempt at comparative study. The use of national product aggregates which, in fact, are summaries of varieties and masses of partial data fitted into a common framework, is at present the only way out of the dilemma caused by the need for comprehensive measures for a number of countries, on the one hand, and the near impossibility of securing, on a systematic basis, fully particularized data, on the other.

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*I am indebted to Miss Lillian Epstein for assistance in statistical compilation and calculations, and profited from her patient editing of the text.

That long-term records of national product and its components are indispensable for study of the general characteristics of economic growth of nations can hardly be gainsaid. Indeed, the major difficulty is not in the defects of the national product measures, but in their scarcity. Yet those that we have can be subjected to far more comparative analysis than has been the practice so far. Provided that we recognize the assumptions and the difficulties, much can be learned.

II. Conceptual Problems

The problems of an acceptable definition of national product, discussed at length by generations of scholars in the field, can be grouped under three heads: (a) delimitation of scope, involving the distinction between economic activity and social life at large; (b) questions of valuation, involving the base to which economic activities are to be reduced; (c) and problems of netness and grossness, involving the distinction between costs and net returns of economic activity. Adequate discussion of these three complexes of problems is impossible here. We only indicate the major effects which their treatment has upon long-term estimates of national product. By so doing we hope to avoid two extreme impressions: that the conceptual difficulties are too great to yield useful estimates, and that the conceptual compromises are so negligible that the estimates represent a precise record.

(A) In general, only activities whose results are channeled through the market place or through some other social institution extraneous to the family (e.g. government) are easily recognized as economic and are likely to be fully reflected in measurement. Economic activities within the household tend to be mixed with others and one cannot tell whether housework is a truly economic activity or part of life in general. Even when such activities are recognized as economic and are measured in terms of persons engaged, hours spent, or products turned out, their proper evaluation is far from easy. Economic growth is often accompanied by a shift in economic activities from the household into the market place; or by a more rapid rise in the volume of market- or society-bound activities than in the volume of those within the household. It follows that long-term product estimates tend to have an upward bias (i.e. exaggerate the rate of growth): the omission of activities producing goods (whether consumer or capital goods) for internal consumption is likely to be relatively more important for the early part of any long period than for the later. This is particularly true if, for the country and period under observation, economic growth has been substantial: other conditions being equal, the greater the growth, the greater the shift from the household into markets (private or public) and the greater the possible upward bias arising from differential underestimation of non-market production.

(B) The activities subsumed under national product, whether in terms of services of factors or in terms of products which they yield, are weighted by prices since prices are the only socially determined system of weights. Two aspects of this use of prices as weights in long-term records of national product should be noted. First, systems of price weights selected from different parts of a given long period may yield different rates of growth in national product in constant prices. In general, use of price relations for the early part of a period may yield a higher rate of growth since goods that are highly priced in the early years are likely, in response to these higher price levels, to grow more than other products, and their relative price position may be lower at the end of the period. Conversely, use of a more recent system of price relations is likely to yield a lower rate of growth in national product over the period. Such difficulties cannot be resolved by mixing the price weights, which only confuses the meaning of the resulting measures; or by using chain indexes, in which the shifts in weights become fractionalized

in short links--only to be reassembled when the total long period is brought into focus.

It is misleading to speak of the upward bias resulting from the use of "early" price weights and of the downward bias resulting from the use of "late" price weights: these are not biases but reflections of different vantage points from which economic growth is seen. In the former case we look at them with the eyes of the contemporaries of the early period--say the 1860's; in the latter case with the eyes of contemporaries of the recent period--say the 1950's. And one may argue that, in general, economic growth should always be examined from the vantage point of the present, if only because this is a more complete view than that from the past looking forward. Whatever the argument, the usual practice is to employ recent-year weights--which means that every generation the indexes must be revised and history partially rewritten.

The other peculiarity of price series is a distinct defect--they lack sensitivity to aspects that should be reflected. Changes in quality, unless expressed through some overt product-differentiation, are not usually recorded by prices. Many such changes, either deterioration or improvement are not adequately measured in the available price indexes (which are often limited to standard commodities anyway). Since much of the adjustment for price changes takes the form of dividing current price totals by price indexes, and since we can assume that over the long run quality improvements far outweigh quality deterioration, the common practices mean a downward bias in national product in constant prices. Were such totals more sensitive to quality changes, the rates of growth might well be significantly higher than those now shown.

(C) The distinction between costs and net returns of economic activity, or between intermediate (used in production) and final (for ultimate users) goods, turns essentially on what we recognize as the basic purposes of economic activity; and these may differ from one social order to another. But if we agree that in the economic societies of the last two centuries the basic purpose is satisfaction of wants of ultimate consumers, present and future, we can draw the main line of distinction and narrow the problem to institutional changes that shift that line perceptibly. Viewed in this fashion, the long-term records of national product suffer from a bias that reflects the increasing complexity of society in the process of economic growth, and the increasing use of resources that are on the borderline between business costs and ultimate consumption. In the private sector there are the increasing outlays on professional training, on union, association, banking, and other fees, etc.--the whole array of expenses undertaken largely or in good part for the sake of effective performance as an income earner in a complex urban civilization. In the public sector much of the increased governmental expenditures is not on services to ultimate consumers but on intermediate goods--whether services to business or for the maintenance of the fabric of society at large. Yet the customary estimates of national income include all these outlays as final products, suspect though they are of being at least in part costs of production. The resulting upward bias in the long-term series of national product is relative to a set of measures geared to stricter concepts of ultimate consumption and capital formation.

Even the brief statements above reveal that the complex problems in the definition and measurement of national product arise from the use by observers of one yardstick over long stretches of space and time, whereas different standards are in fact used in the real world. In the latter, institutional changes shift the line of distinction between what is currently recognized as economic activity and as human activity at large; the relative scales of valuation in different markets differ and change; increasing complexity of life produces confusion between economic costs and net returns. The raw facts would, therefore,

be no help. In essence, the very concept of "economic," let alone of economic growth, is an abstraction; and is a distorition of the observable flow of life since it exaggerates elements which are obscured and beset by numerous changes and deviations.

And yet to abandon an attempt to study economic growth, to refuse to introduce some comparability and continuity into changing historical reality, would be even a greater distortion--for it would imply no similarity of purpose and organization between the society of today and yesterday, between the United States in 1950 and in 1850, or for that matter between the United States, the U.S.S.R. and India in 1950. Such an implication is clearly belied by numerous chains of historical continuity within the development of any one society, and by numerous links that bind various societies in the world to a common heritage in which they all share. Even in individuals, whose life spans are so much shorter than those of societies, memory, motivation, and decisions cover long periods; and involve comparison of the present with the past--denying that these are two different and separate worlds without continuity. This chain over time is all the more apparent in the ties that bind successive generations. One is, therefore, compelled to distill a common set of purposes, a common set of criteria that will provide the basis for comparability over time and space--a basis that should be acceptable, in one of several variants, so long as there is no major break in historical continuity or in the concert of societies with a common heritage.

Although there is agreement upon the relevance of and the need for these common bases that transcend institutional shifts or differences over time and space, there may be disputes as to precisely where to draw the lines in specific measurement for given countries and periods; and there may be room for variant expressions or formulations of one set of common purposes and criteria, which would be most illuminating in the quantitative differences which the resulting variants would show. It is possible, and would be useful, in estimating national product for a country over a long period, to attempt approximations that yield at least the order of magnitudes of biases. An adequate attempt in this direction would, however, involve detailed monographic studies since it is only through careful scrutiny of the changing institutional structure of a country that useful estimates of such biases can be secured. Such attempts would be welcome, and it is to be hoped that they will become more numerous in years to come. But meanwhile we must operate with the available long-term records, crude and subject to biases though they are; and treating them as approximations, study them for the findings they may yield.

It is important to note that, on the basis of present evidence, the biases of the type discussed above, while substantial, are not so dominant as to rob the measures of meaning. Although it is impossible to present such evidence in detail, we give one example relating to the biases that may result from differential undercoverage of household activities. In the United States, the share of agriculture in the labor force declined from about 50 percent in 1870 to about 13 percent in the late 1940's, and its share in net national product (or income) declined from about 27 percent to about 8 percent.[1] Let us make the extreme assumption that underestimation of household activities was limited to the agricultural sector in 1870 and constituted 50 percent of agriculutre's economic product included in the estimate. The initial national income figure for 1870 should, therefore, have been about 14 percent (i.e. 0.27 x 0.51) higher, or 114 instead of 100. Yet, as measured, national income in constant prices rose from

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[1]See Income and Wealth of the United States, Income and Wealth Series II (Bowes and Bowes, England, for the International Association for Research in Income and Wealth, 1952), Tables 17 and 19, pp. 102 and 107.

about $9.4 billion in the 1870's to about $109 billion in the 1940's, a rise from 1 to about 11.6.[2] Adjustment for the bias would reduce the growth to one from 1 to 10.2--still an impressive rise and still leaving the United States among the countries with high rates of long-term growth.

The illustration may be atypical in some respects, but as will be seen below, the rates of growth as recorded in the available series are large and the differences among them are substantial enough to dwarf the biases. Furthermore, the latter offset each other to some extent--some tend to exaggerate rates of growth, others to understate them. In short, the similarities and differences that are reflected in the measures of national product commonly used are quite real and generally accepted by those individuals who are aware of economic events and of differences in economic fortune among nations. The differences in power to satisfy wants expressed through disparities in rates of economic growth or in per capita income levels are not statistical illusions. They find their embodiment in flows of goods to consumers, in the stock of real capital over which they can dispose, and in the degree of their protection from material insecurities. Realization of the dependence of our measures on basic criteria and of the biases to which the estimates may be subject should not blind us to the fact that such biases are qualifications, not negation, of the significance of the measures.

III. The Average Rates of Growth: Summary of Evidence

In Table 1 we bring together measures of average rates of growth, expressed as percentage changes per decade, for population and total national income or product and income or product per capita, in constant prices, for some 19 countries. The absolute figures from which these rates have been computed and notes on the sources of the estimates used are assembled in reference tables in the Appendix.

All countries for which estimates in constant prices for a period of forty years or longer are available are included. Since the records are affected by economic cycles with a duration of 4 to 11 years, and in some countries possibly by longer swings of 20 years or more (of which more below), it was considered unwise to calculate rates of economic growth, of secular trends, for periods much shorter than 40 years.

The list can perhaps be extended by dint of further work; but in the immediate future, say within the next decade, few additions can be expected. For the present we may take the list as given and observe that, with few exceptions--Spain, Hungary, pre-war Russia, and Ireland or Eire--the list is limited to what are now recognized as developed countries; and even the exceptions are well above the economic levels of most countries recognized as under-developed today. The list is dominated by countries of Western, Central, and Northern Europe, and their offshoots overseas (the United States, Canada, Australia, New Zealand, and the Union of South Africa). The exclusion of most of the world, and particularly of the less developed countries, limits and conclusions that we may reach, although some inferences with worldwide implications will be noted below.

Even within this limited list of countries there are extreme variations with respect to size--whether measured by area, population, or any other relevant characteristics. There are contrasts between the multimillion populations of the United States, Russia, and the major countries of Europe, on the one hand, and the few millions in the Scandinavian countries and New Zealand. Coupled

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[2] Ibid., Table 1, p. 30.

TABLE 1.--Percentage Change per Decade, Population, National Product, and Product per Capita, Constant Prices, Nineteen Countries, First Half of 20th Century

Country	Initial Period	Terminal Period	Percent Change per Decade: Population	National Product	National Product per Capita
	(1)	(2)	(3)	(4)	(5)
1. United Kingdom, excluding Southern Ireland	1895-1904	1949-53	5.6	17.2	11.0
2. Ireland & Eire[a]	1894-1903	1949-53	-1.6	14.6	16.3
3. France, incl. Alsace-Lorraine	1901-10	1949-53	0.6	11.1	10.4
4. Germany[b]	1895-1904	1950-54	9.8	19.9	8.3
5. Switzerland	1890-99	1949-53	7.7	24.4	15.3
6. Netherlands	1900-08	1950-54	14.3	24.6	9.0
7. Denmark (Net domestic product)	1894-1903	1950-54	11.9	30.6	16.7
8. Norway (Gross national product)	1900-08	1950-54	8.2	33.5	23.4
9. Sweden (Gross domestic product)	1894-1903	1950-54	6.6	37.8	29.2
10. Italy	1894-1903	1950-54	7.0	22.2	14.2
11. Spain	1906-13	1949-53	8.8	14.9	5.6
12. Hungary	1899-1901	1949	6.2	15.5	8.7
13. Russia & U.S.S.R.[c]	1900	1954	12.3	33.1	18.6
14. United States	1894-1903	1950-54	15.0	33.8	16.4
15. Canada	1895-1904	1950-54	20.9	41.4	17.0
16. Union of South Africa	1911/12	1949/50-1952/53	20.9	49.7	23.8
17. Japan	1893-1902	1950-54	13.3	37.9	21.7
18. Australia	1898-1903	1949/50-1953/54	17.2	28.4	9.5
19. New Zealand	1901	1949/50-1953/54	18.7	32.7	11.8

[a]Average of Ireland for 1894-1903 to 1904-13 (weight 1) and Eire for 1911 to 1949-53 (weight 4)

[b]Average of Pre-W.W.I. territory for 1895-1904 to 1905-14 (weight 1); 1925 territory for 1913 to 1935-41 (weight 2.5) and Western Germany for 1936 to 1950-54 (weight 1.6).

[c]Average of Russia for 1900 to 1913 (weight 1.3) and the U.S.S.R for 1913-54 (weight 4.1).

with these differences in size are differences in the strength of economic ties with other units. In general, smaller countries, particularly when developed, are almost compelled to rely in the process of growth on close ties with larger economies; and the relevance of this observation is obvious not only for the members of the British Commonwealth, but also for the smaller countries in Northern and Central Europe. The rates of growth that we will compare are, therefore, for units of markedly different degrees of economic independence. However, in this respect the sample that we have is typical of the world, with wide diversity among the national units both in size and in degree of dependence upon economic ties abroad.

Several aspects of the practices followed in calculating the rates for Table 1 (and several subsequent tables) should be noted. First, for any country for which the measures were available, we preferred to use estimates of national income or net national product (the terms are used interchangeably, since there is no clear conceptual basis for distinguishing between them). This is the total of all goods at cost to ultimate consumers plus net capital formation including changes in claims against foreign countries; or alternatively, total net output at factor costs. But for some countries only estimates gross of capital consumption are available or gross also of intermediate products of government activities; and for still other countries only domestic rather than national product totals are given (i.e. excluding adjustments for net flow of income across boundaries). For Russia and the U.S.S.R. the concept differs from those for other countries in its exclusion of services (personal and government) not embodied in commodities. In such cases we were compelled to use these somewhat different series, as is indicated in Table 1.

But this divergence in concepts has only limited effect on comparability of derived rates of growth: differences in the latter that are produced by shifts from the net to the gross basis, or from the national to the domestic basis, are moderate and far smaller than the actual differences observed among the countries and than the margins of error of the measures. For the United States, in addition to the calculations for net national product appearing in line 14, column 4, we calculated rates of growth for national product gross of capital consumption and gross also of intermediate products of government in the 1950-54 terminal period (but not in the initial period). The resulting rates of growth are 35.1 percent for national product gross of capital consumption, and 37.8 percent for national product gross of both capital consumption and government outlays on goods and services, compared with 33.8 percent for net national product. The differences are quite moderate--and yet there are grounds for assuming that they are proportionately greater for the United States than for most other countries covered.

Second, and most important, the period covered includes wars, revolutions, and other dislocations, even changes in territory. While I adjusted for the last by combining rates of growth for sub-periods, each with a constant territory, I did not adjust for the possible effects of external conflicts or internal disruptions. The decision not to make this adjustment reflects a view that these "abnormal" events may be part and parcel of the process of economic growth within national units in the world organized as it was during the last two centuries; and that to exclude them from coverage limits in advance the kind of economic growth that is to be studied.

Third, the initial and terminal periods are, wherever possible represented by averages that cover a number of years sufficient to reduce the effects of short-term factors, particularly those associated with business cycles. In general, I tried to use averages for periods not much shorter than a decade. But this rule had to be relaxed even when lack of data did not compel such relaxation: for post-World War II years it seemed preferable to take an average for the latest available quinquennium, to minimize the effects on the rates of growth of the possibly depressive consequences of participation in that war.

Fourth, the average rates are simple geometric means, and were in fact calculated from the logarithms of the values for the initial and terminal periods, the dates of which are given in columns 1 and 2.

The findings suggested by Table 1 may now be listed.

(A) The decade rates of change in population range from a decrease (for Ireland and Eire) to growth at less than 1 percent (for France) to rates of almost 21 percent (for Canada and the Union of South Africa). The countries with higher rates of population growth are, in general, the overseas offshoots of Western Europe--the young countries in the Western Hemisphere, Australia, and Africa, although there are interesting exceptions in the cases of Netherlands and Japan. The group with low rates is a rather miscellaneous category, but is limited to the older countries of Europe.

(B) The decade rates of growth of total product range from 11 percent (for France) to almost 50 percent (for the Union of South Africa), although the latter may be exaggerated since the estimates do not allow fully for the much less favorable development of the economies of the native tribes on their reservations. Here again the countries with the highest rates are the overseas offshoots of Western Europe, but also, significantly, the Scandinavian countries, Japan, and Russia. The countries with the lowest rates are either those with low rates of population growth (Ireland and France), or those definitely among the economic laggards within the Western family of nations (Spain, Hungary, Italy).

(C) The decade rates of growth in per capita product range from under 6 to over 29 percent. In the group with the highest rates are two of the three Scandinavian countries, the Union of South Africa, and Japan. In the group with somewhat lower rates are Russia, the United States, Canada, Denmark, and Ireland. As already indicated, the estimates for the United States are on a somewhat netter basis than those for most other countries, in that they exclude the intermediate product of the governmental sector. Interestingly enough, Australia and New Zealand are not among the countries with the higher rates of growth in product per capita, being in a group with France, Germany, and the Netherlands.

Limitation of Table 1 to the recent half century allowed one to include as many as 19 countries. But the period is not too long on a secular scale, and I extended it back into the nineteenth century where possible. With coverage for at least two decades before 1900 it is also possible to approximate rates of growth up to World War I and compare these rates for earlier, less war-affected periods with those during the twentieth century, when two world wars must have had a profound effect on the levels of economic growth. The approximations to the average rates of growth, for both the longer period from the nineteenth century to date, and the shorter period ending before World War I, are provided for eleven countries in Table 2.

The omission of eight countries naturally reduces variability and differences; but, by and large, neither extending the period into the nineteenth century nor ending it before World War I produces marked changes. We still find a range in rates of population growth from negative levels for Ireland or very low positive levels for France, to high rates for the United States and Canada. The Scandinavian countries, United States, Russia, Canada, Japan, but now Germany also, show high rates of growth in total national product, and Ireland, France, and Italy are still at the lower end of the scale. There is a similar showing with respect to rates of growth in product per capita, except that the position of Ireland and France is somewhat better here than in the growth of total product, and that of Russia is somewhat worse.

TABLE 2.--Percentage Change per Decade, Population, National Product, and Product per Capita, Constant Prices, Eleven Countries, Two Periods of Coverage from the 19th into the 20th Century

Country		Initial Period	Terminal Period	Percent Change per Decade: Population	National Product	National Product per Capita
		(1)	(2)	(3)	(4)	(5)
1. United Kingdom	(a)	1860-69	1949-53	8.0	21.5	12.5
	(b)	1860-69	1905-14	11.1	25.0	12.5
2. Ireland & Eire	(a)[a]	1860-69	1949-53	-3.5	12.8	16.8
	(b)	1860-69	1904-13	-5.4	11.6	17.9
3. France	(a)	1841-50	1949-53	1.3	15.3	13.8
	(b)	1841-50	1901-10	1.9	18.6	16.3
4. Germany	(a)[b]	1860-69	1950-54	10.1	27.4	15.1
	(b)	1860-69	1905-14	11.5	35.6	21.6
7. Denmark	(a)	1870-78	1950-54	11.5	30.1	16.7
	(b)	1870-78	1904-13	11.3	32.7	19.3
9. Sweden	(a)	1861-68	1950-54	6.6	36.0	27.6
	(b)	1861-68	1904-13	6.8	34.8	26.2
10. Italy	(a)	1862-68	1950-54	6.9	18.0	10.4
	(b)	1862-68	1904-13	7.0	15.7	8.1
13. Russia & U.S.S.R.	(a)[c]	1870	1954	13.4	31.0	15.4
	(b)	1870	1913	15.7	27.7	10.4
14. United States	(a)	1869-78	1950-54	17.4	41.2	20.3
	(b)	1869-78	1904-13	22.3	56.0	27.5
15. Canada	(a)	1870-79	1950-54	18.3	41.3	19.3
	(b)	1870-79	1905-14	17.8	47.1	24.7
17. Japan	(a)	1878-87	1950-54	12.7	42.3	26.3
	(b)	1878-87	1903-12	11.6	49.2	33.7

Numbering of countries is the same as in Table 1.

[a]Average of Ireland for 1860-69 to 1904-13 (weight 4.4) and Eire for 1911-51 (weight 4).

[b]Average of Pre-W.W.I. Territory for 1860-69 to 1905-14 (weight 4.5); 1925 Territory for 1913 to 1935-41 (weight 2.5); and Western Germany for 1936 to 1950-54 (weight 1.6).

[c]Average of Russia for 1870-1913 (weight 4.3) and the U.S.S.R. for 1913-54 (weight 4.1).

However, while the broad ranges and the relative positions of the eleven countries are about the same for the different periods, there are some significant changes in the levels of the rates of growth, and occasional marked displacements of position that are of interest. These are pointed up in Table 3, which gives for the eleven countries the average rates of growth for the two periods that are farthest apart and duplicate each other least--the pre-World War I period, lying largely in the nineteenth century (from Table 2), and the periods lying almost entirely in the twentieth century (from Table 1).

The following general observations seem warranted by the evidence in Table 3.

(i) In a number of countries, rates of growth of population are markedly lower in the later than in the pre-World War I period (the United Kingdom, France, Germany, Russia, the United States). But surprisingly, in a number of countries population was growing at a higher rate in the twentieth century than in the pre-World War I period, although the acceleration was quite mild.

(ii) Changes in the rates of growth of national product were far larger than in rates of growth of population. In most countries the rates in the twentieth century were lower than in the period preceding World War I. But there were some interesting exceptions--Ireland and Eire, Sweden, Italy, and Russia. In Ireland, the slowing down in the rate of decline of population is an associated, and perhaps explanatory factor. In Italy, inclusion of the disturbed decades from 1860 to 1880, before political unification became a complete reality, may be the reason why the earlier period rates are lower than those during the twentieth century. In Russia the belated "industrial" and other revolutions are explanations. But for Sweden no reason comes to mind, and in view of the very high rates of economic growth in that country, the finding is all the more intriguing.

(iii) Changes in the rates of growth of national product per capita from the pre-World War I period to the recent half century, are quite marked for some countries--particularly when wars or revolutions intervene (e.g. Germany, Russia, and Japan). By and large, the rates of growth in product per capita tend to be lower during the recent period, but again with exceptions, most of which were noted under (ii) (Sweden, Italy, and Russia).

(iv) The effects of different chanees in rates of growth of the several aspects on the ranking or relative position of the countries are least for population, and greatest for income per capita (lower panel of Table 3). The total change in ranks between the two periods is only ten points for rates of growth of population; twenty points for rates of growth of total national product; and twenty-six points for rates of growth of product per capita. In other words, differences in population growth patterns were more stable than were those in growth of total product and particularly of product per capita.

(v) The conspicuous shifts in ranks were largely associated with major events of the type that we ordinarily classify under wars or revolutions. This certainly was true of the marked changes in ranks in the product columns for Germany, Italy, and Russia. Even for the United States, wars and their effects both in limiting immigration and in diverting large proportions of national product to uses that, in our estimates, are excluded from net product, were a heavily contributing factor. And yet, despite the contrast in the historical character of the two periods in Table 3, the changes in relative position judged by rates of growth, particularly in population and total product, were moderate.

TABLE 3.--Percentage Change per Decade, Population, National Product, and Product per Capita, Constant Prices, Eleven Countries, pre-World War I (I) and 20th Century (II) Periods Compared

Country	Population Period		National Product Period		Product per Capita Period	
	I	II	I	II	I	II
			Percentage Change			
1. United Kingdom	11.1	5.6	25.0	17.2	12.5	11.0
2. Ireland & Eire	-5.4	-1.6	11.6	14.6	17.9	16.3
3. France	1.9	0.6	18.6	11.1	16.3	10.4
4. Germany	11.5	9.8	35.6	19.9	21.6	8.3
7. Denmark	11.3	11.9	32.7	30.6	19.3	16.7
9. Sweden	6.8	6.6	34.8	37.8	26.2	29.2
10. Italy	7.0	7.0	15.7	22.2	8.1	14.2
13. Russia & U.S.S.R.	15.7	12.3	27.7	33.1	10.4	18.6
14. United States	22.3	15.0	56.0	33.8	27.5	16.4
15. Canada	17.8	20.9	47.1	41.4	24.7	17.0
17. Japan	11.6	13.3	49.2	37.9	33.7	21.7
			Ranks			
1. United Kingdom	5	3	4	3	3	3
2. Ireland & Eire	1	1	1	2	5	5
3. France	2	2	3	1	4	2
4. Germany	7	6	8	4	7	1
7. Denmark	6	7	6	6	6	7
9. Sweden	3	4	7	9	9	11
10. Italy	4	5	2	5	1	4
13. Russia & U.S.S.R.	9	8	5	7	2	9
14. United States	11	10	11	8	10	6
15. Canada	10	11	9	11	8	8
17. Japan	8	9	10	10	11	10

IV. Implications for the Comparative Growth of Advanced Countries and the Rest of the World

Several aspects of the findings in the preceding section suggest broader implications. First, the rates of growth, for the countries covered in Tables 1-3, are quite high. This is of particular interest in connection with product per capita, a crude but sensitive index of the rise in economic attainment related to the number of persons to be sustained by it. A decade rate of increase of 8 percent will cumulate in a century to 115 percent, i.e. will mean more than doubling; and yet of the nineteen countries in Table 1 only Spain shows a lower rate, and that for a period marred by a civil war. A decade rate of fifteen percent means more than quadrupling in a century; and yet ten of the nineteen countries show higher rates for per capita produce. A decade rate of twenty percent means more than sextupling in a century; and a twenty-five percent rate means a rise over a century to more than nine times the initial level. Even if

we allow for upward biases and scale the rates down a quarter--which is a generous allowance indeed--the fact remains that, at least for the countries in the list, the rates of growth in per capita product over the periods covered in the preceding section are remarkably high.

The countries discussed above account for only a small fraction of the world's population. Excluding Russia or the U.S.S.R. and the few countries outside the orbit of Western European civilization proper, the total amounts to less than a fifth of world population. Setting off these countries against the rest of the world will indicate how special and limited a sample we have, and will also permit some inferences as to the comparative growth of these advanced countries and of the rest of the world.

In this comparison we must use data that are even cruder and chancier than those employed so far. With advance apology, I still argue that such comparisons must be attempted in order to see whether we can at least outline the order of magnitude of major differences and changes.[3]

The wide and rather heterogeneous regions employed in Tables 4 and 5 are adopted designedly to reduce detail and to present a broad picture. Thirteen of the nineteen countries in Table 1 belong either to region 1 or 2 in Tables 4 and 5. The six countries that do not are Russia, Japan, the Union of South Africa, Spain, Italy, and Hungary (the latter three fall in region 4). In the discussion in this section I shall concentrate on the contrast between regions 1 and 2, which shall be designated "advanced" and the rest of the world, except Russia--most of this "rest" dominated by the economically underdeveloped and poor countries.

The comparisons in Tables 4 and 5 refer to different dates and different economic magnitudes (those for 1929 are limited to major branches of commodity production), and use somewhat different methods of reducing the estimates for the several countries to a common denominator. But we are interested less in the differences in relative per capita levels of the several regions shown by the three comparisons than in the broad similarities. They all indicate that region 1 of the advanced group is characterized by per capita income levels from four to six times the world average, and region 2 by levels from two to three times the world average. No other region in the world comes close to these high per capita income or production levels. In other words, the sample studied in Tables 1-3 is one of richer countries, with the highest per capita income levels in the world.

With some knowledge of the rate of growth in per capita income of this sample of advanced countries in the background, we may now raise two questions: (A) What can be assumed concerning the rate of growth in per capita income in the rest of the world? Has it grown as much, less, or more than in the two advanced regions? In other words, has the disparity in per capita income levels between the advanced regions and the rest of the world increased or decreased? (B) What can be inferred concerning the relative per capita income position of the underdeveloped countries today, compared with the per capita income levels of the developed regions before their industrialization?

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[3]Some of the ground of this section was covered, with somewhat different emphasis, in two recent papers, both in press: "Underdeveloped Countries and the Pre-Industrial Phase in the Advanced Countries--An Attempt at Comparison," submitted to the World Population Meeting in Rome in September, 1954; and "Regional Economic Trends and Levels of Living," presented at the 30th Institute of the Norman Waith Harris Memorial Foundation at the University of Chicago in November, 1954. But I decided to include the relevant discussion here partly because of the importance of the problems raised, partly because they assume some new aspects in the present context.

TABLE 4.--Distribution of World Population and Income, 1938 and 1949

	1938			1949		
	Percent of World Population	Percent of World Income	Relative Income per Capita (World = 100)	Percent of World Population	Percent of World Income	Relative Income per Capita (World = 100)
	(1)	(2)	(3)	(4)	(5)	(6)
1. Overseas descendants of (2)	7.1	29.6	419	7.5	44.4	590
a. United States	6.1	25.9	429	6.5	40.9	626
2. Western Europe	10.1	27.7	275	10.0	21.5	214
3. U.S.S.R.	7.9	8.1	102	8.4	11.2	133
4. Other Europe	8.4	10.8	129	6.4	6.0	94
5. Latin America	6.0	4.2	71	6.6	4.4	66
6. Asia	53.2	17.3	33	52.4	10.5	20
7. Africa	7.3	2.3	32	8.6	2.0	24

Line 1 includes the United States, Canada, Australia, and New Zealand.

Line 2 includes Western, Central, and Northern Europe. Excludes countries east of Germany and Austria, and the Balkan, Iberian, and Appenine peninsulas.

Line 5 includes all countries and regions south of the United States borders, including the Caribbean.

The calculations for 1938 are based upon the totals given in W. S. and E. S. Woytinsky, World Population and Production (The Twentieth Century Fund, New York 1953) Table 187, p. 395. The division between Western Europe and Other Europe is based upon the more detailed data for 1938 in ibid., Table 185, pp. 389-90.

The calculations for 1949 are based upon the estimates in National and Per Capita Incomes, Seventy Countries--1949, Statistical Office, United Nations, Statistical Papers, Series E, No. 1, October 1950. However, we added estimates for Eastern Germany, Spain, and Bulgaria and replaced the estimates for the few countries in Africa by a total for that continent. These additions were made on the basis of estimates for 1948 given in Woytinsky, op. cit.

TABLE 5.--World Production (Agriculture, Mining, Manufacturing) 1929

	Percent of World Population	Percent of World Production	Per Capita Production (World = 100)	Percent of Total Production		
				Agriculture	Mining	Manufacturing
	(1)	(2)	(3)	(4)	(5)	(6)
1. Overseas Descendants of (2)	7.2	35.8	495	33	7	61
a. United States	6.3	31.7	501	31	7	62
2. Western Europe	10.8	25.8	238	27	5	68
3. U.S.S.R.	7.7	7.8	101	59	3	38
4. Other Europe	8.3	7.9	95	59	3	38
5. Latin America	6.0	4.7	79	66	9	25
6. Asia	53.0	16.2	31	79	2	19
7. Africa	6.9	1.8	16	65	18	16

For definition of regions see the notes to Table 4.

The table is based on Ludwik Landau, Gospodarka Swiatowa (The World Economy) Instytut Gospodarstwa Spoleçnego (Institute of Social Economy), Warsaw 1939 (French summary).

The figures are derived largely from international production data published by such agencies as the International Institute of Agriculture in Rome and the League of Nations--output being weighted by prices in international trade. For manufacturing, value added figures were used, and for many countries the estimates had to be based upon the number of workers engaged and a somewhat arbitrary allocation of value added per worker.

(A) We may begin with the first question in terms of the recent half century--since our records are most plentiful for 1900-50. The data in Table 1 indicate that the growth between 1900 and 1950 in per capita income of the United States and Canada was roughly about 115 and 120 percent respectviely; for Australia and New Zealand about 60 and 75 percent each. In view of the dominant weight of the United States, the growth in per capita income for region 1, without allowance for changing population weights, would be well over 100 percent for the half-century from 1900 to 1950. A similar calculation for the several countries classified under region 2 (The United Kingdom, France, Germany, Netherlands, the Scandinavian countries, Switzerland) suggests a growth of well over 50 and perhaps closer to 75 percent. The question then may be raised whether in the other regions of the world, particularly the underdeveloped areas of Asia, Africa, and Latin America, the half-century since 1900 witnessed a rise in per capita income as great as say 60 to 100 percent.

A precise and well-founded answer to this question cannot be given, if only because the rest of the world, even excluding the U.S.S.R., is so heterogeneous that we would need measures for many parts and several decades to document the answer. Earlier discussion showed that some countries in these other regions of the world, notably Japan and the Union of South Africa, do show rates of growth of per capita income appreciably higher than those just suggested for the advanced countries. Other units may well be found in Asia, Africa, Latin America, and Other Europe, which would show growth in per capita income equal to or exceeding 60 to 100 percent between 1900 and 1950. Yet, allowing for such enclaves, the weight of evidence seems to me in favor of an inference that no such rise in per capita income could have occurred in most of the countries, in most of the population masses of Asia, of many countries of Africa, perhaps also of Latin America, and even Other Europe.

Three types of evidence may be indicated. The first, and in a way the most important, are the direct scraps of evidence that we have. In Table 1 neither Spain nor Hungary shows a rise in per capita income equal to 60 percent. Recent calculations for Egypt, not included in the reference tables because work is still going on, indiacte that between 1898 and the 1950's, population more than doubled (from less than 10 to well over 20 million) but per capita income apparently remained at the level of some 10 E L per capita in 1913 prices without any perceptible upward trend. The older national income estimates for India, so glibly used by Western scholars, were recently analyzed by Daniel Thorner and found worthless as bases for judgment of economic trends.[4] But a comparison calculation of crop output cited by Thorner suggests that between the mid-1890's and the early 1940's the index of crop output rose only 10 percent whereas population grew almost 40 percent. Even allowing for possible underestimates for the earlier years in the crop indexes, there is no indication of growth in agricultural output per capita.[5] In a paper on the national income of Mexico, Henry G. Aubrey attempts a comparison between Humboldt's estimate for 1803 and what was known about the income in the mid-1930's.[6] His conclusion is that while population grew from about 6 to about 18

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[4] See Economic Growth--Brazil, India, Japan, edited by Simon Kuznets, Wilbert E. Moore, and Joseph J. Spengler, Duke University Press, 1955, pp. 103-108.

[5] In the United Provinces, a region in India which accounted for over 46 million inhabitants in 1921 and about 55 million in 1941, real income per head rose by barely 3 percent from 1921/2 to 1938/9 (See Shri Gopal Tiwari, Economic Prosperity of the United Provinces, Asia Publ. Co., Bombay-Calcutta 1951, Table 119, p. 262.)

[6] See his The National Income of Mexico, (Estadistica, June 1950, Vol. III, No. 27, pp. 185-198).

million, per capita income in gold units appears to have grown little, if at all. My impression is that further search in the literature would turn up more items of direct evidence of the moderate rate at which per capita income grew in most areas within the "rest of the world" category. In general, one can argue that a rise in real per capita income of 60 to 100 percent is substantial enough to be reflected not only in figures (which are not available) but in the tenor of everyday life, in the types of qualitative change that are recorded by non-statistical observers. Little in the historical records relating to the presently underdeveloped countries of the world can be interpreted as constituting evidence of such a rise.

The second class of evidence bears only obliquely upon the question under discussion, but is of interest in and of itself. Table 6 gives the rates of population growth over the last half century in over fifty countries, as well as by major world regions distinguished in the United Nations demographic analysis. These data convey the strong impression that in the relatively underdeveloped parts of the world, the areas included under our "rest of the world," there is a group in which population grew quiet rapidly, at rates appreciably higher than those in the currently developed countries during their phase of population "swarming." Rates above 20 percent per decade are quite common in Latin America and Asia. At the other extreme, we find countries most of which are not in the specific records because their very state precludes acceptable and current statistics. In Asia as a whole the rate of growth is estimated to be 8.2 percent per decade, but all the countries specifically listed, even India, show higher rates. The rate of growth assigned to China, the dominant member of the unspecified residual, must be well below the 8 percent figure. Similarly, for Africa the over-all rate of growth is estimated to be 7.1 percent per decade, but the four countries listed specifically and accounting for over a fifth of the region's population show rates that together average over 15 percent per decade. The residual total of the population of Africa must have grown at a rate well below 7 percent per decade.

TABLE 6.--Rates of Growth of Population, Individual Countries and World Regions, 1900-1950

Country	Period Covered	Percent Rate of Growth per Decade	Population 1950 (Millions)
	(1)	(2)	(3)
Europe			
1. United Kingdom	1901-51	5.6	50.4
2. Irish Free State	1901-51	-1.7	3.0
3. Denmark	1901-50	10.7	4.3
4. Norway	1900-50	7.4	3.3
5. Sweden	1900-50	6.5	7.0
6. Finland	1900-50	8.7	4.0
7. U.S.S.R.	1900-50	11.7	193.0
8. Austria	1900-51	3.8	6.9
9. Hungary	1900-49	6.3	8.0
10. Czechoslovakia	1900-49	0.5	12.3
11. Switzerland	1900-50	7.3	4.7
12. Netherlands	1899-1950	14.5	10.1
13. Belgium	1900-50	5.1	8.6
14. France	1901-50	0.9	41.9
15. Portugal	1900-50	9.4	8.5
16. Spain	1900-50	8.2	27.9
17. Italy	1901-51	7.0	46.3
18. Greece	1896-1907;1921-51	12.8	8.0
19. Bulgaria	1900-49	13.1	7.2 (1949)
		Sum of Above:	455.4

TABLE 6--Continued

Country	Period Covered	Percent Rate of Growth per Decade	Population 1950 (Millions)
	(1)	(2)	(3)
I Europe and Asiatic U.S.S.R.	1900-50	7.0	594
Africa			
20. Egypt	1897-1950	15.1	20.4
21. Union of South Africa	1904-51	20.9	12.3
22. Algeria	1901-48	13.7	8.8
23. Tunisia	1921-46	18.4	3.2 (1946)
		Sum of Above:	44.7
II Africa	1900-50	7.1	199
Asia			
24. Burma	1901-50	12.2	18.5
25. Ceylon	1901-50	16.3	7.5
26. Formosa	1920-51	27.2	7.5
27. India	1901-41; 1941-51	9.2	358.0
28. Japan	1920-40; 1940-50	14.4	82.9
29. Korea	1910-44	20.9	29.3 (1949)
30. Philippines	1903-51	22.4	19.9
31. Thailand	1911-50	22.5	18.3
32. Feder. of Malaya	1901-51	38.9	5.2
		Sum of Above:	547.1
III Asia (excluding U.S.S.R.)	1900-50	8.2	1,272
Northern America			
33. Canada	1901-51	20.0	13.3
34. United States	1900-50	14.7	151.7
		Sum of Above:	165.0
IV Northern America	1900-50	15.4	166
Latin America			
35. Cuba	1899-1950	27.2	5.4
36. Dominican Republic	1920-50	33.3	2.1
37. El Salvador	1901-50	13.2	1.9
38. Guatemala	1893-1950	13.3	2.8
39. Honduras	1901-50	23.1	1.5
40. Mexico	1900-50	13.7	25.7
41. Nicaragua	1906-50	18.2	1.1
42. Jamaica	1911-50	14.3	1.4
43. Puerto Rico	1899-1950	17.9	2.2
44. Argentina	1895-1950	30.6	17.2
45. Bolivia	1900-50	12.2	3.0
46. Brazil	1900-50	25.2	52.1

TABLE 6--Continued

Country	Period Covered	Percent Rate of Growth per Decade	Population 1950 (Millions)
	(1)	(2)	(3)
47. Chile	1895-1952	14.8	5.8
48. Colombia	1905-50	23.5	11.3
49. Uruguay	1900-49	21.2	2.4 (1949)
50. Venezuela	1920-50	27.5	4.9
		Sum of Above:	140.8
V Latin America	1900-50	20.8	162
Oceania			
51. Australia	1901-51	17.3	8.2
52. New Zealand	1901-51	18.8	1.9
		Sum of Above:	10.1
VI Oceania	1900-50	16.7	13
VII World Total	1900-50	8.9	2,406

Notes:

All Arabic numeral lines except 7 are based on data in the United Nations Demographic Yearbook, 1952, Tables 2 and 3. For columns 1 and 2, census enumeration figures from Table 2 were used; for column 3 annual estimates from Table 3. Only those countries were selected for which the period covered more than a quarter of a century and for which current population exceeded a million. Adjustment was made for change in area--two periods in column 1 indicating a substantial change. Areas used were ordinarily post-World War II.

Line 7 is from W. S. and E. J. Woytinsky, World Population and Production, Twentieth Century Fund, New York, 1953, Table 17, p. 44.

The Roman numeral lines (for world regions) are from United Nations, Determinants and Consequences of Population Trends, Population Studies, No. 17, New York 1953, Table 2, p. 11.

This contrast between low rates of population growth in many underdeveloped areas of the world and high rates in others, suggests an implication of bearing upon the question under discussion. In the areas where opportunities for economic growth existed, the response of population by rapid growth was quite marked; and with rapid population growth the possibilities of substantial rises in per capita income were much more limited than they would have been otherwise. In areas where, at least under the existing social and political conditions, economic growth was difficult, a Malthusian limit was set upon the rate of population growth--operating through the persistence of high death rates, epidemics, famines, etc. In their case, the likelihood of a substantial secular rise in per capita income is low.

The third point in the argument that the per capita income of the "rest of the world" grew at only moderate rates during the recent half century is based upon the very low level of the per capita income today. For many areas the per capita income is so low that one wonders how the population can survive. Even

if one allows for biases, the fact still remains that the supply of goods per capita is low to the point of endangering life and health. If so, how could substantial growth have occurred? A rise of 60 percent means that per capita income at the beginning of the century was less than two-thirds of the present level; a rise of 100 percent implies an initial level half the present. Could the populations of many underdeveloped countries of today have managed on two-thirds or half of their present per capita supply of goods? While such a possibility need not be excluded, it is extremely difficult to envisage this lower level of economic supply, and particularly to understand how from such an initial point any economic growth is feasible.

In considering this point, it must be remembered that improvements in sanitation, medicine, etc. which, with only a small input of resources, counteract serious deficiencies in the supply of food, clothing, or shelter, are attainments of recent decades. This means that fifty years ago a supply of goods per capita as low as today would have been accompanied by much worse consequences in the way of famines, epidemics, and mortality. In a sense, therefore, a lower subsistence level was less feasible in earlier days than it is today. All of which makes it more difficult to accept the premise that the per capita income levels in many underdeveloped countries of today were significantly lower in 1900, thus permitting a substantial rate of growth over the recent half century.

The three items of evidence cited above are not conclusive. But the weight is quite heavily in favor of the assumption that the rates of growth during the last half century in per capita income in the "rest of the world" must have been much lower than those established for the advanced countries of regions 1 and 2. And there is little, if any, evidence to the contrary. The disparity between the advanced countries and the "rest of the world" in per capita income must, then, have increased since 1900.

This conclusion can immediately be extended over a longer period. Discussion of Tables 2 and 3 indicated that, on the whole, in the developed countries, the rates of growth in per capita income were lower during the recent decades than earlier. In general, then, one would expect the rates of growth during the second half of the nineteenth century to have been appreciably above those in 1900-50 for most large countries in regions 1 and 2. Application of such rates over a period of 100 years to the current per capita income levels in the underdeveloped areas would yield impossibly low initial levels in 1850. This argument for assuming a lower rate of growth in per capita income in the underdeveloped than in the advanced countries becomes stronger as we extend the comparison back into the nineteenth century; and we can reasonably claim that the disparity in per capita income levels between the advanced countries and the "rest of the world" has been growing apace over the last century.

The full implications of this finding can hardly be discussed here. But one involves the second question under discussion. If the last century witnessed a lower rate of growth of per capita income in the "rest of the world" than in the advanced countries, the current disparities may be partly, or even wholly, due to these differences in trends in per capita income. In other words, current international differences in per capita income are congealed effects of past differences in the rate of growth of per capita income. But over how long a period in the past? Can we assume that current differences in per capita income levels between the "rest of the world" and the advanced countries are accounted for completely by differences in rate of growth since the beginning of industrialization--in other words, that at that point, the initial levels in the presently advanced countries and the currently underdeveloped were about the same?

(B) The answer to this question depends upon the relation among three elements of empirical evidence: (i) the disparities in current levels of per capita income between presently underdeveloped countries and the advanced countries; (ii) the past rates of growth of per capita income in the advanced countries; (iii) the period elapsing from the point of time when the modern processes of industrialization and economic growth may be said to have begun in the presently advanced countries.

It is difficult to secure accurate measures for any of these three elements. The available estimates of per capita income are presumably biased and may exaggerate the true contrast--largely because they tend to understate the incomes of less developed countries relatively more than they do the incomes of more developed areas. The measures of rates of growth in per capita income probably suffer from a similar bias, i.e. exaggerate the rate of growth, although to a lesser degree than in current international cross-section comparisons. The dating of the beginning of industrialization is a problem of historical research and requires more work and knowledge than are within my reach. Nevertheless, we attempt rough analysis and weigh the limited evidence to see whether a fairly meaningful answer can be derived.

In Table 4 the range between the per capita inocmes of Asia and Africa, on the one hand, and of Western Europe on the other, is between one to nine and one to ten; if comparison is made with region 1, the range is extended to between one to over thirteen or one to over twenty-five. The former range, for 1938, is low because in that year United States income was still depressed by the developments that followed 1929. If we use Latin America as the lower term of the comparison, the range between it and Western Europe is between one to three and one to four; between it and region 1, between one to six and one to nine. The ranges suggested in Table 5 for 1929 are of about the same dimensions. We may assume here that the range in per capita income between the more underdeveloped regions of Asia and Africa and Western Europe is, to put it moderately, about one to eight; and in comparison with region 1, about one to twelve. Similar ranges with Latin America as the lower term would be one to four and one to six, respectively.

In general, the rates of growth of per capita income in Western Europe, with properly small weight assigned to the high rates in the Scandinavian countries, could, on the basis of our data, be set between 12 and 15 percent per decade; those for region 1 somewhat higher, probably closer to 20 percent. On this basis, the following, rather hypothetical calculation can be made. Assuming that the rates just suggested are extrapolated into the past, how many decades back would we have to go in the advanced regions to reach levels comparable with the per capita incomes in the underdeveloped countries today?

For Western Europe, the high rate of 15 percent per decade means that to reach the current levels of Asia-Africa, i.e. one-eighth of the current per capita income, one would have to go back about fifteen decades; to reach the levels of Latin America, about ten decades. Either period is quite long, compared with that which elapsed since the beginning of industrialization in most countries of Western Europe. With the exception of England, in which the rate of growth in per capita income is well below 15 percent per decade, effective industrialization in Western Europe can be assumed to have begun about the middle of the nineteenth century or later. Even on the basis of this comparison, it would seem that the per capita income levels in Western Europe before industrialization must have been significantly higher than they are in the underdeveloped countries of Africa and Asia today; although it is not as certain that they were higher than the current per capita income levels in Latin America. But the comparison stacks the cards against the hypothesis--partly because it uses a high rate of growth in per capita income for the advanced countries

without the allowance for bias that was made, at least in part, for the international comparisons of current levels, and partly because, if industrialization began late, the extension of a high rate of growth all the way back is unwarranted since such high rates became feasible only with industrialization. Hence the impression that the current per capita levels in the underdeveloped countries, and even in Latin America, are significantly below those in Western European countries before their industrialization, is warranted.

Similar results are reached in comparison with region 1. If we use a high rate, say 20 percent, we would have to go back over thirteen decades to reach per capita levels comparable to those of underdeveloped countries in Asia and Africa, i.e. one-twelfth of the present level in the United States. But this does not allow for the bias in the rates of growth (the inclusion of the Civil War period alone would mean a sizeable reduction in the rate of growth of per capita income in the United States and hence in region 1); and even at that carries us back to a time well before the beginning of industrialization in the United States--let alone other countries in region 1 in which the industrialization proces began much later. If we assume a more moderate rate of growth in the United States, or accept more fully the present international disparities (at the range of one to twenty), the shortage of the current per capita income levels in Asia and Africa, compared with the United States levels at the beginning of industrialization, i.e. in the late 1840's, will emerge quite strikingly indeed. A somewhat similar result would be secured in comparisons for Latin America, although here the inferiority of per capita levels today to those in the developed countries overseas before their industrialization is more doubtful.

This question requires much further exploration. But it is sufficiently important to merit attention. If the answer suggested here is valid, two inferences follow. First, present international differences in per capita income, specifically the differences between the less developed countries in the "rest of the world" and the advanced countries, are due only in part to differences in the rates of growth of per capita income during the period associated with the industrialization process of the advanced countries. In other words, the presently developed countries were already in advance of the "rest of the world" when modern industrialization began--and the latter only increased the disparity. Second, while the presently developed countries entered the industrialization process from the position of advance, or superiority, at least with respect to per capita income, to the "rest of the world," the currently underdeveloped countries in the "rest of the world" face the prospect of industrialization from a position of inferiority in that their per capita incomes lag substantially behind those of the advanced sector of the world's economy today. The implications of this situation are not obvious. This difference in initial starting point and relative position does not necessarily mean economic growth of the authoritarian and forced type. There is no inevitability about the progressive increase of the pressure of backwardness as the lag behind advanced countries increases. But that the implications are important and have to be studied carefully--in the light of the experience of other "laggards" in the process of economic growth--need hardly be stressed.

V. Implications for Differences in Growth Among Advanced Countries

A second aspect of the findings relating to average rates of growth, which merits specific discussion, concerns the rather large differences in these rates in population, in total product, or in product per capita--among countries even within the advanced group.

An illustration drawn from the reference tables in the Appendix reveals the point clearly. For the United States, total population in the 1870's was about 45 million, for the United Kingdom (excluding Southern Ireland) about 29 million,

with the ratio of the former to the latter, therefore, about 1.55. By 1950-54 the United States population was 158 million, that of the United Kingdom about 50 million, and the ratio was 3.16, or about twice as large. This marked change in ratio is the cumulative effect over some eight decades of a difference in the decade rates of growth of population between 17.4 and 8.0 percent (see Table 2); yet this difference between rates of growth is smaller than that observable for many other pairs of countries. Furthermore, if we assume that the per capita income levels in these two countries in the early 1870's were about the same, then the difference between the 12.5 percent rate of growth for the United Kingdom and the 20.3 percent rate for the United States would result, in eight decades, in a per capita income in the United States 71 percent larger than in the United Kingdom. Multiplying the widening divergence in population totals by that in per capita incomes, we find that whereas the economic magnitude of the United States measured by its total inocme, was in the 1870's 1.6 times that of the United Kingdom, by 1950 the ratio became 5.4, or had grown almost two and a half times.

The point in general is that differences in long-term rates of growth, because they refer to long periods, can cumulate to very substantial relative differences. This obvious but nevertheless important point can be put into simple algebraic form:

Consider A_1 and A_2, two initial magnitudes (say population, total product, or per capita product); define the initial relative as $D = A_1/A_2$ (the percentage difference being $D - 1$ multiplied by 100); designate the percentage rates of growth per decade for the two initial magnitudes r_1 and r_2, respectively; and then define the terminal relative, after a period of growth over time t, as F (the percentage difference being $F - 1$ multiplied by 100).

Then:

$$F = A_1(1 + r_1)^t/A_2(1 + r_2)^t = D(1 + r_1)^t/(1 + r_2)^t$$

or in logarithms:

$$\log F = \log D + t[\log(1 + r_1) - \log(1 + r_2)]$$

The terminal relative disparity will be the greater, the greater the initial disparity, the longer the period of time involved, and the greater the difference between rates of growth of the initial quantities--provided all the disparities are in the same direction.

The aspect of this relationship most significant in the present connection is that it is the absolute differences between the rates of growth that are important. Consider the following illustrative application of the simple equation above:

On the assumption that $A_1 = A_2$, i.e. that $D = 1$, what will be the relative between the terminal quantities with varying spreads between r_1 and r_2 and varying numbers of decades in t?

In every line of the illustrative table the level of r_2 is half that of r_1, i.e. the percentage rise per decade of the second item is half that of the first. But if the over-all level of the decade rates of increase is low, so that the spread between the percentages is small absolutely, even after twenty decades the disparity is barely above 20 percent. If, however, the over-all level of the percentage rates is high, and the absolute spread between them is large, as it is in the fourth line, in less than five decades the second item, orginally equal to the first, will be more than twice the size of the first.

r_1 in percent	r_2 in percent	Spread between r_1 and r_2	F, terminal relative		
			t - 5	t - 10	t - 20
2	1	1	1.051	1.104	1.218
10	5	5	1.262	1.592	2.535
20	10	10	1.545	2.387	5.699
40	20	20	2.161	4.672	21.830

The bearing of this simple algebra will become clear if we argue that under conditions in which absolutely large rates of growth can occur, large absolute differences among these rates are also more likely than in a situation in which, in general, rates of growth are low. If technical and other conditions are such that growth of population and of per capita product vary around 5 to 10 percent per decade, absolute spreads among percentage rates--especially long-term average rates--cannot be expected to run large either, certainly not as large as when the rates of growth of population or of product per capita are 20 percent per decade.[7]

If then we can assume that, associated with the high over-all level of rates of growth already commented upon in Section 4, are large absolute differences in rates of growth among countries, even within the limited group covered in Tables 1-3, it follows that displacements in relative magnitude among countries can occur within rather short periods. Since international relations are greatly affected by shifts in the relative economic magnitude, and hence in power, of countries, one can argue that the very rapidity of modern growth is in a sense a cause of the rapidity with which relative power positions of countries change; and hence possibly of difficulties in adjusting international relations to these shifts in underlying economic power. If, to illustrate, a condition of original inferiority in total economic magnitude (measured, say, by total national income), represented by a ratio of 0.5 to 1, can be corrected in two or three decades by an absolute disparity in rates of growth of say 25 percent (the absolute difference between r_1 and r_2) it will not be long before the political and power relationship based on this initial inferiority begins to show signs of strain. It is in this connection that the sizeable differences in rates of growth observed in Tables 1-3 assume particular importance. In short, one may argue that when growth is rapid and the pace of human history, itself a cause of rapid shifts, is fast, adjustments are more difficult than when rates of growth are moderate and the whole pace of change, internal and external, is slower.

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[7] The one important exception to this generalization occurs when the rates of change dip below the 0 line, i.e. the change is a decline. Since the average rates in question are algebraic averages, low positive levels may then mean large deviations. The assumption of a positive association between high average rates of growth and large absolute differences among them should, therefore, be confined to countries and periods in which long-term declines are absent. This is certainly true of modern times, but not of some earlier periods of history.

VI. Inter-Country Associations of Rates of Growth of Population and Product

It will have already been observed that, by and large, substantial rates of population growth tend to be accompanied by high rates of growth of total product (e.g., in the United States and Canada); and conversely, low rates of population growth tend to be accompanied by comparatively moderate growth of national product (e.g., in Ireland and France). The purpose of this section is to check these impressions by testing these associations statistically. The relevant measures are assembled in Table 7.

Since the distributions of the variables involved cannot be treated as normal, and since we do not wish to let the larger countries dominate the picture completely, the association is studied by ranking the countries in increasing order of the rates of growth (see e.g. the rankings in the lower panel of Table 3). From these ranks I computed the Spearman coefficient of rank correlation, which varies from +1 for complete positive association to -1 for complete negative association. This coefficient (designated by the Greek letter rho) is more sensitive to disparities in rank than tau, a similar measure designed by M. G. Kendall.

It is possible to test the resulting coefficients for statistical significance, i.e. to ascertain what the chances are of securing in a sample of given size a value as high or higher (i.e. not less algebraically) from a universe in which there is no association. If the chances of finding a large or larger coefficient of correlation are high, little significance can be attached to the derived coefficient as an indication of association, since it could be secured easily from a universe in which no true association exists. The conventionally accepted limits of chance, indicative of the acceptance of a hypothesis of significant association, are either the 1 or the 5 percent levels. With these criteria in mind we can inspect Table 7 to learn what findings it suggests.

(A) In general, there is a positive association between rates of growth of population and of total product. All the coefficients of rank correlation in column 1 are positive and substantial; and the tests indicate that most of them are significant at the 1 percent level. The association is in part produced by the inclusion of the "younger," "emptier" countries like the United States, Canada, and other overseas offshoots of Western Europe, with their rapid growth of both population and total product. When these countries are excluded, the positive association is reduced slightly, but still remains positive and significant.

It may seem at first that such an association is inevitable; if population grows rapidly, with corresponding increases in the numbers of workers and consumers, total product should also grow rapidly. But there is nothing inevitable or mechanical about such an association. It is possible for population in one country to grow at a rate high relative to rates of population increase in other countries, and yet for the increase in total product in that country to grow at a rate lower than those in other countries with somewhat more moderate rates of population growth. This has in fact occurred within the limited sample covered in Table 7, which explains why the coefficients in several cases are substantially below +1. It may well be asked whether the positive association would hold if the sample were extended to cover many underdeveloped countries--a question which will be discussed below.

(B) There is positive association between rates of growth in total product and in product per capita. All the coefficients in column 3 are positive and fairly high; and they are all significant at the demanding 1 percent level.

TABLE 7.--Associations Among Rates of Growth of Population, National Product, and Product per Capita, Constant Prices, Inter-Country Comparisons, Different Periods

	Population and National Product		National Product and National Product per Capita		Population and Product per Capita	
	ρ	Probability of obtaining a value not less	ρ	Probability of obtaining a value not less	ρ	Probability of obtaining a value not less
	(1)	(2)	(3)	(4)	(5)	(6)
Based on Table 1						
1. 19 Countries	+0.72	0	+0.77	0	+0.21	0.190
2. 14 Countries[a]	+0.63	0.008	+0.74	0.001	+0.07	0.422
Based on Table 3						
3. 11 Countries, Period I	+0.80	0.002	+0.84	0.001	+0.40	0.113
4. 11 Countries, Period II	+0.83	0.001	+0.81	0.001	+0.46	0.072
5. 9 Countries,[b] Period I	+0.67	0.024	+0.75	0.010	+0.10	0.386
6. 9 Countries,[b] Period II	+0.80	0.005	+0.82	0.003	+0.42	0.135
Larger Countries[c]						
7. 7 Countries, Period I	+0.86	0.006	+0.82	0.012	+0.43	0.161
8. 7 Countries, Period II	+0.93	0.001	+0.86	0.006	+0.68	0.045

[a]Excludes the United States, Canada, Union of South Africa, Australia, and New Zealand.

[b]Excludes the United States and Canada.

[c]Includes United Kingdom, Germany, France, Italy, Russia, United States, and Japan.

The entries in columns 2, 4, and 6 are based upon the formula $t = \rho \sqrt{\frac{n-2}{1-\rho^2}}$ given in Maurice G. Kendall, Rank Correlation Methods (London, 1948), p. 48 and his table of values in ibid., Appendix Table 4, pp. 144-145.

This clearly implies that differences in the rate of growth of total population are not the only factor that produces differences in the rate of growth of total product, and possibly not even the dominant one. For if they were, there would be no ground for expecting that when the direct influence of population is removed in the per capita product figures, there would be any significant association between the growth in the latter and that in total product.

Here again the association is not in the nature of an arithmetical or mechanical necessity. It is possible for a country with a comparatively high rate of increase in per capita product to have a rate of growth in total product that is low relative to that in other countries, because the growth of its population is at comparatively low levels; and conversely it is possible for a country with a comparatively low rate of growth in per capita product to have a relatively high rate of growth in total product. It is these cases that reduce the coefficients in column 3 below +1, and indicate the possibility of no correlation, or, under some historical conditions, even of negative correlation.

(C) All the coefficients of rank correlation between rates of population growth and of growth in product per capita are positive--suggesting that, within the sample of countries covered, countries with relatively high rates of population growth also had higher rates of growth of total product and of per capita product, and vice versa. But none of the coefficients in column 5 is significant at the 1 percent level and only one, that in line 8, for the larger seven countries alone, is significant at the 5 percent level.

This lack of clear-cut association between rates of growth of population and of per capita product is confirmed when we check back to the detailed entries in Tables 1-3. Here we find countries in which the rates of growth in population have, on the whole, been quite moderate on comparison with those in other countries, and whose rates of growth in per capita product are among the highest (notably Sweden). There are also countries with relatively high rates of population growth, and rather moderate rates of growth in per capita product (notably the Netherlands and Australia). Next we find countries with low rates of growth in both population and per capita product (notably Italy). In short, the variety of combinations is wide, and it is this mixture of relations that naturally produces an insignificant correlation.

This does not mean that the rate of growth of population is not an important factor affecting the rate of growth of per capita product: it would be unrealistic to argue that many aspects of the population growth process have no effect on the growth of total economic activity, and hence on change in per capita product. It does mean that under different conditions, in different phases of growth, the effects are different and, perhaps, even in opposite directions. Thus, in Russia before World War I a comparatively rapid rate of population growth was accompanied by only a moderate rate of growth in product per capita, because the transformation of the economic system, particularly before the late 1890's, was too slow to supply the growing population with a vigorously rising level of per capita product. Yet during the same period, both the much faster growing population of the United States and the much slower growing population of Sweden were enjoying per capita products that were growing at comparatively high rates. Even within one and the same country, as will be suggested below, there may be phases in which a high rate of population growth is accompanied by a high rate of growth in product per capita, other phases in which a moderate rate of population growth is accompanied by a high rate of growth in product per capita, and still others in which the rates of growth of both population and per capita product are moderate.

Because relations between growth of population and product, total and per capita, can be so diverse for different phases and conditions of growth, it is difficult to infer what the associations would be if we expanded the sample much

beyond the limits covered in Table 7--particularly if we included many underdeveloped countries. One may conjecture that the association between rates of growth of total population and of total product would remain positive and significant. To the extent that in many underdeveloped countries population growth has been held back, largely by Malthusian positive checks, any acceleration in the rate of population growth would certainly mean at least a corresponding acceleration in the rate of growth of total product--per capita product at least not declining. Hence, low rates of population growth would be associated with low rates of growth of total product. Nevertheless, the outcome of this association for a wider sample is not assured: we would be combining advanced countries, whose rates of population growth are low because they are at the end of the long secular swing in rates of population increase, with underdeveloped countries whose rates of population growth are low because they have not yet entered the phase of "population swarming"--the initial phase of the long secular swing just referred to.

Such conjectures for the larger, worldwide sample, uncertain for the association between rates of growth of population and of total product, are equally uncertain for that between rates of growth of total and per capita product; and even more so for that between rates of growth of population and of per capita product. It may well be that with the inclusion of many underdeveloped countries we would find a significant positive association between rates of growth of population and of per capita product, because of the addition of many underdeveloped countries in which low rates of population growth are due to economic stagnation and hence are accompanied by low rates of growth in product per capita. Moreover, in the underdeveloped countries of Asia and possibly of Africa (but not of Latin America), the low rates of economic growth during the past century may have meant comparatively low rates of population growth, as well as low rates of growth in total and per capita product. Hence, their inclusion in the sample would tend to strengthen the positive associations noted in Table 7. However, inclusion of the underdeveloped countries of Latin America may not have the same effect since over the recent long run many of them had high rates of population growth and comparatively moderate rates of growth in product per capita.

Whatever the case, we repeat that the findings suggested in Table 7 are strictly limited by the sample of countries included; that the positive associations indicated, while likely to be confirmed and strengthened by inclusion of many other countries outside the largely developed group, may be qualified further when the scope of observations is widened. In particular, it is clear that the relations between rates of population growth and those in total and per capita product undergo some systematic changes in the course of secular development; and hence any inter-country correlation of the type attempted is a cross-section analysis of units in different phases of development and can assume full meaning only when these phases are taken into account and the association between similar or distinct phases--not among countries in identical chronological periods--is studied. We limit our discussion here to cross-section associations only because our knowledge of the distinct phases in secular development is in so rudimentary a stage that recognition of specific phases is still a matter for the future.

VII. Variations in the Rate of Growth Over Time: Measures of Consistency

The discussion so far has dealt with the average rate of growth per decade over long periods for some countries. In so far as these averages were derived from terminal levels that were relatively free from short-term disturbances, they reflect the rates at which the cumulative process of long-term change proceeded during the period under observation. But we should also know whether

these averages over periods ranging from 40 to over 100 years represent consistent movements over time, or whether, because the rates of long-term change are variable, the averages are for a universe with a wide range from quite low to very high rates. An average rate, say a rise of 20 percent per decade in a country's total product, means one thing if the change from decade to decade hovers around this level of 20 percent and quite another if some decade changes are as low as 0 (or even negative) and others as high as 100 percent.

The analysis of the variability of rates of change to which this section and sections 8 and 9 are devoted, is beset with difficulties. First, it requires continuous long-term records. Continuity means data at intervals close enough for us to observe the long-term movements for successive segments of the entire period. And the total period must be long enough for us to discern any systematic pattern of change over time in the secular changes themselves. This requirement immediately narrows our sample of countries: for only twelve of the nineteen countries are the records sufficiently continuous to permit such analysis. Even further reduction is necessary when we study some systematic patterns of variability.

Second, the analysis makes much greater demands upon the accuracy and reliability of the estimates than are involved in dealing with averages over long periods. In general, weaknesses in the estimates for some phases of the period are likely to have a more limited effect on the averages over the period as a whole than on findings relating to the pattern of changes over time. This difference has been demonstrated by recent revisions in the long-term estimates for Italy: while the effect on the average rate of growth over the period since the 1860's was minor, that on the pattern of movement of the decadal rates over time was quite substantial. The difficulty is complicated by the fact that, national product estimates being such complex amalgams of various bodies of data of different reliability, it is almost impossible for one man to subject a number of estimates for different countries to effective critical review. Any findings that such an analysis will yield must be treated as tentative and subject to further check; and further revision of the underlying data (as well as expansion of the sample of countries covered) must be expected to yield more substantial changes in these findings than in those relating to average rates of change.

Third, the findings are tentative because the subject is relatively new and, consequently, there is almost no established knowledge against which to check them. While some broad features of the economic growth of nations during the last two centuries are evident, the detailed features of the pattern of secular growth over time are not known. We are, therefore, groping in a relatively unknown terrain in which the bearings are few and far between.

With these preliminary warnings, we turn to the question central to this section. How consistent is the observed process of long-term change? If our averages indicate growth, can such growth be observed from decade to decade, or is it subject to major interruptions so that periods in which no secular rise occurs are followed by others in which growth is accelerated?

The answer to this question depends upon three aspects of the quantitative analysis involved. The first is the minimum period over which we can observe a secular level. If short-term changes are characteristic, e.g. business cycles in the case of economic activity or short cycles in the case of population, we should presumably deal with time units long enough to eliminate these short-term disturbances. In this analysis I have used, whenever possible, averages for decades.

Second, we could measure changes from one decade average to the next, overlapping by one year, i.e. employ a ten-year moving average. This would leave us with an interval of one year between one decade and the next, but a year is too short an interval for the study of long-term change. The practice here has, therefore, been to allow a minimum interval of a decade--whenever the underlying estimates permitted me to do so. Even so, I sometimes stretched the interval longer, as I usually did at the end of the period--to extend the last interval to cover both World War II and the reconstruction years that followed.

Third, while changes were thus measured from one decade average to the next, I allowed for a five-year overlap, i.e. began the second interval not ten years but five years after the first. This was done in order to yield a more detailed pattern of change over time. Thus, a series that covers one hundred years yields nineteen decade averages instead of ten and, therefore, eighteen decade intervals instead of nine. I could have shortened the overlap between successive intervals, and thus have had a larger number of intervals, but I felt that the detail resulting from a five-year overlap was sufficient for the present analysis.

These comments should make it possible to follow the entries in Table 8. Panel A summarizes the characteristics of the long-term series for the twelve countries suitable for analysis in this and, with some exceptions, in the following sections. It shows the length of the time units for which average levels of population and income have been calculated; the length of the intervals between the successive approximations to secular levels resulting from these calculations; and the overlap among the successive intervals allowed for in the analysis. This information is relevant to the discussion not only in this section, but also in Sections VIII and IX; although it can be gleaned directly from the reference tables in the Appendix.

Panel B deals directly with the question of consistent growth. By consistency I mean first that, given an average rate of long-term change, the changes for all, or nearly all, the distinct intervals from one decennial secular level to another were in the same direction. This test of consistency is applied in columns 2, 4, and 6, where the number of intervals in which there was no secular rise are entered. Since all the average rates of growth, except for the population of Ireland and Eire are positive (see Tables 1-3), the entries in columns 2, 4, and 6 (with the single exception of that in column 2 for Ireland) indicate the number of violations of consistency. The result of this test is obvious: with one exception all our long-term records suggest consistent growth. In other words, movements in the direction of the average rate of decadal change are shown in all or almost all the intervals distinguished in the long series. The single exception is in the case of population of France, in which three of the ten intervals show declines rather than rises; but since the average rate of growth over the entire period is below 2 percent per decade, this showing is hardly surprising.

Another test of consistency, this time of the process of growth viewed as one of sustained minimum increase, is provided in columns 3, 5, and 7. Considering the absolute values shown in Tables 1 and 2, I take a change of less than 2 percent per decade for population, less than 5 percent per decade for per capita product, and less than 10 percent per decade for total product, as indicative of the absence of sustained growth; and enter in these columns the number of intervals in which growth falls below these limits. Here we find that the proportion of intervals falling below such lower limits is quite high for the populations of Ireland and Eire and of France, and for the total product of Ireland, affected as it is by declines in total population. But otherwise the record of consistency is quite high. The only new significant exception is in the case of per capita product in Italy. The average rate of growth in the latter

TABLE 8.--Characteristics of Series and Measures of Consistency of Rates of Growth, Selected Countries

A. Characteristics of Series

Country	Total Period	Units	Intervals	Overlap	Number of Intervals
	(1)	(2)	(3)	(4)	(5)
United Kingdom	1860-1953	decades	decades	5 years	16
Ireland & Eire	1860-1953	varying from 7 to 15 years	varying from 7 to 15 years	0 to 7 years	8
France	1841-1953	decades	decades	no overlap	10
Germany	1860-1914	decades	decades	5 years	8
Netherlands	1900-54	decades	decades	5 years	8
Denmark	1870-1954	decades	decades	5 years	14
Norway	1900-1954[a]	decades	decades	5 years	6
Sweden	1861-1954	decades	decades	5 years	16
Italy (a)	1862-1954	decades	decades	5 years	16
(b)	1879-1954	decades	decades	5 years	12
United States	1869-1954	decades	decades	5 years	14
Canada	1870-1954	decades	decades	5 years	14
Japan	1878-1954	decades	decades	5 years	12

[a]Except for World War II period.

B. Measures of Consistency

Country	Population			Total Product		Product per Capita	
	Number of Intervals	Number of Intervals Showing Decline	Number of Intervals Showing Rise less than 2 Percent	Number of Intervals Showing Decline	Number of Intervals Showing Rise less than 10 Percent	Number of Intervals Showing Decline	Number of Intervals Showing Rise less than 5 Percent
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
United Kingdom	16	0	0	1	2	1	3
Ireland & Eire	8	7	8	0	3	0	1
France	10	3	6	2	2	1	2
Germany	8	0	0	0	0	0	0
Netherlands	8	0	0	1	2	2	3
Denmark	14	0	0	0	1	1	1
Norway	6	0	0	0	0	0	0
Sweden	16	0	0	0	0	0	0
Italy (a)	16	0	0	1	5	2	8
(b)	12	0	0	1	3	1	5
United States	14	0	0	0	1	1	1
Canada	14	0	0	0	1	1	4
Japan	12	0	0	0	0	1	1

for the period since 1879 (omitting the first two decades, still disturbed because of incomplete political unification), is over 12 percent per decade; yet in five of the twelve intervals the rate fell short of the minimum level set. This suggestion of extreme variability and lack of consistency in the rate of secular growth in Italy, found also in total product, warrants further exploration.

The entries in Panel B of Table 8 clearly indicate that the process of secular growth is, on the whole, highly consistent: over decennial intervals between successive decade averages failures to rise less than fairly substantial minimum percentages are few and far between. The good result is, of course, partly a matter of definitions, yet our definitions of minimum periods, minimum intervals, and minimum rates of growth are hardly arbitrary. It cannot be denied that for the selected countries covered, largely those among the more developed, the secular growth during the last century--even including major wars--has been a remarkably sustained process. Even a casual look at long-term statistical series reveals the dominance of a sustained upward movement of the basic quantities which dwarfs the minor variations that we characterize as short-term changes.

Indeed, the finding of fairly high consistency of growth may be implicit in the finding of high average levels of decadal rates of growth discussed in the earlier sections. If levels of growth over a decade have ceilings fairly close to the average rates of growth computed, an unusually high rate of growth over any one interval is possible only in a recovery from an unusually depressed level; and even so, the rates over the "depression" and the "recovery" intervals taken together may still fall below the average rate for a long period. Ipso facto, a high average rate of growth would then mean relative infrequency of intervals with no growth or with growth below fairly substantial minimum levels. For example, let us assume that the average rate of growth in total product is 30 percent per decade; that the "normal" ceiling is 40 percent per decade; and that the maximum possible rise over a decade is 50 percent per decade (i.e. from unusually low levels). Then, an interval with 0 growth would have to be made up by two intervals with 50 percent growth each (which could not occur in succession) or by three intervals with 40 percent growth each. Since we must allow for other deviations below the average level of 30 percent, this illustration leaves little possibility for more than one interval, out of say ten, with no growth if an average rate of 30 percent is to be assured. This does not mean that a high rate of growth is necessarily accompanied by complete consistency of growth over time (as defined here); but it does suggest the likelihood of association between high average rates of growth and infrequency of intervals with growth below a fairly high minimum level.

VIII. Variations Over Time: Retardation or Constancy in the Rate of Growth

Consistency of the type just studied does not bar variations over time in the decade rates of growth. Granted that none or only a few intervals fail to show growth of population, total product, or product per capita above fairly sizeable minimum levels, these above-minimum rates can change substantially over time. In dealing with these changes, it is useful to distinguish between possible long-term retardation, constancy, or acceleration in the rates of growth--a simple modification of the average rate that can still be considered a characteristic of the basic, primary secular trend movement on the one hand, and changes in the rates of growth that bear some resemblance to long cycles in that they show alternations of rises and declines on the other. The question of long-term retardation or acceleration is explored in this section; that of long swings in the rate of growth in Section IX.

Because of these swings, a long series is necessary to establish retardation or acceleration in the rate of secular growth so that the variations can effectively offset each other and thus reveal the underlying trend line. Since we have such long records for only some of the countries in our sample, and even in those the period is not as long as we would like, the findings are likely to characterize only part of the universe that should be studied. However, some preliminary notions can be formulated as to the pattern of growth we should expect to find on the basis of what is known of the long-term growth of population and product since the end of the eighteenth century.

As to population, our expectations may be stated as follows. Since the secular decline in death rates, unaccompanied for a while by a similar decline in birth rates, occurred in most countries within the last two centuries, we would expect--in the older countries--an acceleration in the rate of growth of population. This would, in due time, be followed by a decrease in the rate of growth as crude death rates approached the low absolute levels that would make further large absolute cuts difficult, and as birth rates began to decline and reduce appreciably the crude rates of natural increase. This pattern of acceleration followed by retardation--a long secular swing in the rate of population growth--has been observed in a number of those older countries in which the demographic revolution occurred early enough within the last two centuries for the process to manifest itself. In the younger and initially "empty" countries the record may not reveal the early acceleration; but even in several of those, retardation in the rate of population increase is already evident. Since the periods covered in our tables are relatively recent, reaching back only to the mid-nineteenth century, and since the data are largely for the more developed countries, we may, on the whole, expect the rates of growth of population by subperiods to reveal retardation, i.e. decline from the earlier to the later subperiods.

What about the rates of growth in per capita product? The high levels, commented upon above, suggest that such rates for per capita product could not have been maintained over a very long period. If a 14 percent decade rate of growth means that per capita product would more than quadruple in a century, and if a 20 percent rate means that it would more than sextuple, extrapolation of such rates back over two centuries would mean impossibly low initial levels of per capita product (less than one-sixteenth of the present level in the former case; and less than one-thirty-eighth in the latter). In fact, we know that: (A) the per capita product in the United States, for example, if not in 1750 then at least in 1800, was not that low; (B) the high rate of increase in per capita product was definitely associated with the process of industrialization, and most probably began after the initiation of that process and not before. Hence we can assume that if our records extended into the period preceding industrialization, they would reveal an acceleration in the rate of growth of per capita product. We could expect to find in them an upward acceleration phase similar to that in population growth. The timing of this acceleration in growth of per capita product relative to that in growth of population is a subject of great interest. There are some grounds for assuming that the former lagged behind the latter--the initial "swarming" of population causing a delay in acceleration of per capita product, attained only after the process of industrialization reached a certain momentum. But for lack of evidence to test this hypothesis, it must remain in the nature of a hunch.

The next question is whether we would expect the high rates of growth in per capita product, once attained, to continue or to decline with the emergence of a phase of retardation similar to that in population growth but again with somewhat different timing. The grounds for expecting retardation can be expressed most generally by saying that as per capita product rises, the choice between more income and more leisure shifts in favor of the latter. Furthermore, international competition and armed conflicts have retarding

effects. In general, the discussion here takes the position that overt or implicit, hot or cold conflicts, are an integral part of the economic growth of nations in the world as it is now organized; that the role of these conflicts, or rather of the political and other forces making for them, in spreading the industrial system from one country to the other is too basic for such conflicts to be viewed exogenous to process of economic growth. If this position is accepted, the increasing likelihood of major wars as an increasing number of nations reach high levels of industrialization and economic performance, becomes an important basis for expecting that rates of growth in per capita product in the several countries will begin to decline with the spread of the industrial system throughout the world.

There is no room for further elaboration of the hypotheses.[8] We can merely say that, in our records, which for most countries fail to cover the early periods of industrialization, we expect the rate of growth in per capita product to decline. Here again the decline may come somewhat later than that in the rate of growth of population.

The expectations for the rate of growth of total product can be derived from those for population and per capita product. In general, one may expect an acceleration of the rate of growth of total product in the early periods, and a deceleration or retardation in the later periods.

We can now turn to Table 9, which provides for ten countries with comparatively long and continuous records measures designed to indicate whether the rate of secular growth declined, remained constant, or rose. The first set of measures comprises arithmetic means of the decadal rates of change, for groups of intervals into which the total period is divided. For example, for the United Kingdom, for which the total period comprises sixteen intervals, we establish two subperiods--the first eight intervals and the second eight. The arithmetic means of the rates of change of population for these two subperiods are entered in column 1, lines I-1 and I-2 under the United Kingdom. Further, since the total number of intervals is large enough, we divide the sixteen into three subperiods: the first five, the next six, and the last five; and enter the arithmetic means in column 1, lines II-1, II-2, and II-3 under United Kingdom. The entries in columns 3 and 5 are derived similarly.

The purpose in averaging for subperiods is, of course, to eliminate the effects of any variations that may exist in the decadal rates of change calculated for intervals overlapping by five years. It would have been more proper to take geometric means of the decadal percentage changes but the calculation of arithmetic means is simpler, yields measures of dispersion more readily, and does not introduce significant errors.

The second set of measures consists of similar arithmetic means, this time of moving averages of the decadal rates (columns 2, 4, and 6). Whenever possible, I calculated seven-item moving averages of the decadal rates of change--each relating to a total interval of some thirty years (since the decadal averages usually overlapped by five years); modifying the procedure to three-item moving averages when there was little or no overlapping (as in the case of France). These averages provide a moving picture of the underlying trend, presumably free of alternations that occur within periods of thirty to thirty-five years. Since they were needed anyway to test for the consistency of any retardation or acceleration shown, I used them also in calculating arithmetic means for

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[8] For some interesting results bearing on long term changes in per capita product in England since the end of the 17th Century see the paper by Phyllis Beane (this Journal, November 1955). Studies for later periods are reported in Economic History Review (March and September 1956).

TABLE 9.--Averages of Decade Rates of Growth, Population, Total Product, and Product per Capita, Constant Prices, for Groups of Intervals, Selected Countries

Country and Subperiods[a]	Population		Total Product		Product per Capita	
	Decade Units	Moving Averages	Decade Units	Moving Averages	Decade Units	Moving Averages
	(1)	(2)	(3)	(4)	(5)	(6)
United Kingdom, 1860-1953						
I. Two Subperiods						
1. (1860-1914)(1860-1929)	11.2	10.3	26.1	24.6	13.4	12.9
2. (1900-1953)(1885-1953)	5.1	5.9	17.3	17.2	11.6	10.6
II. Three Subperiods						
1. (1860-1899)(1860-1919)	11.5	11.1	28.8	27.3	15.5	14.6
2. (1885-1929)(1875-1939)	7.8	8.0	13.8	16.8	5.4	8.0
3. (1915-1953)(1895-1953)	5.2	5.3	24.2	18.6	18.1	12.7
Ireland & Eire, 1860-1953						
I. Two Subperiods						
1. (1860-1903)(1860-1913)	-6.2	-6.2	10.5	11.3	17.8	18.6
2. (1894-1953)(1885-1953)	-1.6	-2.4	14.5	14.6	16.2	17.5
France, 1841-1953						
I. Two Subperiods						
1. (1841-1900)(1841-1910)	1.9	1.6	18.8	17.3	16.3	15.3
2. (1891-1953)(1881-1953)	0.9	0.7	14.3	15.8	13.1	14.9
II. Three Subperiods						
1. (1741-1880)(1841-1900)	1.6	1.3	16.0	15.8	13.9	14.0
2. (1871-1913)(1871-1910)	2.1	2.0	24.2	23.0	21.6	20.7
3. (1911-1953)(1891-1953)	0.3	0.4	6.8	13.1	6.2	12.4

[a]The sets of dates in the first parentheses refer to the years covered by the averages of decade rates, in the second to the years covered by the averages of the moving averages of the rates.

TABLE 9--Continued

	(1)	(2)	(3)	(4)	(5)	(6)
Germany, 1860-1914						
I. Two Subperiods						
1. (1860-1894)(1860-1904)	9.4	10.3	46.5	44.4	33.9	30.9
2. (1880-1914)(1870-1914)	13.7	12.5	28.2	35.6	12.8	20.9
Denmark, 1870-1954						
I. Two Subperiods						
1. (1870-1918)(1870-1933)	11.4	12.1	34.2	35.5	20.4	20.8
2. (1904-1954)(1889-1954)	11.8	12.0	26.6	30.2	13.1	16.2
II. Three Subperiods						
1. (1870-1908)(1870-1923)	10.8	11.4	31.3	33.9	18.4	20.2
2. (1894-1928)(1879-1943)	14.5	13.1	38.0	37.0	20.5	21.1
3. (1914-1954)(1899-1954)	10.0	11.3	23.5	26.3	12.2	13.3
Sweden, 1861-1954						
I. Two Subperiods						
1. (1861-1913)(1861-1928)	6.8	6.8	34.7	33.2	26.0	24.8
2. (1899-1954)(1884-1954)	6.4	6.0	34.1	32.7	26.5	25.2
II Three Subperiods						
1. (1861-1898)(1861-1918)	6.6	6.7	30.9	33.0	22.9	24.6
2. (1884-1928)(1874-1938)	7.1	6.7	33.8	32.6	24.7	24.2
3. (1914-1954)(1894-1954)	6.0	5.7	38.6	33.2	31.5	26.1
Italy, 1879-1954						
I. Two Subperiods						
1. (1879-1928)(1879-1938)	6.9	6.7	17.4	22.1	9.8	14.5
2. (1909-1954)(1894-1954)	6.8	6.8	19.6	18.5	12.2	11.0
II. Three Subperiods						
1. (1879-1913)	7.1		19.7		11.7	
2. (1899-1933)	5.9		25.8		18.8	
3. (1919-1954)	7.6		10.0		2.2	
United States, N.N.P., 1869-1954						
I. Two Subperiods						
1. (1869-1918)(1869-1933)	21.9	20.6	51.2	45.8	23.9	20.7
2. (1904-1954)(1889-1954)	13.0	14.2	29.6	29.6	14.8	13.5

TABLE 9--Concluded

	(1)	(2)	(3)	(4)	(5)	(6)
United States, N.N.P. 1869-1954 (Continued)						
II. Three Subperiods						
1. (1869-1908)(1869-1923)	22.5	21.8	55.0	49.6	26.5	22.7
2. (1894-1928)(1879-1943)	18.4	17.6	36.9	35.6	15.5	15.1
3. (1914-1954)(1899-1954)	11.6	12.8	28.6	28.7	15.3	14.2
United States, G.N.P., 1869-1954						
I. Two Subperiods						
1. (1869-1918)(1869-1933)	21.9	20.6	52.7	47.2	25.1	22.0
2. (1904-1954)(1889-1954)	13.0	14.2	36.2	34.6	20.8	18.1
II. Three Subperiods						
1. (1869-1908)(1869-1923)	22.5	21.8	56.5	51.1	27.7	24.0
2. (1894-1928)(1879-1943)	18.4	17.6	38.6	37.2	17.0	16.6
3. (1914-1954)(1899-1954)	11.6	12.8	37.0	35.7	22.9	20.6
Canada, 1870-1954						
I. Two Subperiods						
1. (1870-1919)(1870-1934)	18.6	19.0	46.1	40.9	23.0	18.3
2. (1905-1954)(1890-1954)	17.3	19.2	37.5	37.5	17.4	15.6
II. Three Subperiods						
1. (1870-1909)(1870-1924)	14.1	17.5	40.9	42.8	23.1	21.3
2. (1895-1929)(1880-1944)	25.2	21.4	41.6	36.3	12.7	12.0
3. (1915-1954)(1900-1954)	16.3	17.5	42.9	39.5	23.2	19.1
Japan, 1878-1954						
I. Two Subperiods						
1. (1878-1922)(1878-1937)	12.0	12.1	48.2	50.0	32.4	33.8
2. (1908-1954)(1893-1954)	12.6	12.7	44.4	46.6	28.2	30.0
II. Three Subperiods						
1. (1878-1912)	11.4		51.4		36.0	
2. (1898-1932)	12.3		51.7		35.1	
3. (1918-1954)	13.1		35.8		19.9	

subperiods. Thus, for the United Kingdom, there are twelve moving averages (ten seven-item and two five-item averages at the ends). Entries in lines I-1 and I-2 under the United Kingdom in columns 2, 4, and 6, are arithmetic means of the first six and the last six moving averages; those in lines II-1, II-2, and II-3, are arithmetic means of three groups of four. In general, the moving averages give more weight to the decadal rates of change that are away from the ends of the original period of the series, and less weight to the terminal rates. The arithmetic means that they yield are, therefore, less affected by the terminal decadal rates than the arithmetic means in columns 1, 3, and 5, and since the terminal rates are likely to be more erratic, the arithmetic means derived from moving averages are somewhat more stable.

The findings of Table 9 can now be listed:

(A) Population in several countries--the United Kingdom, France, Sweden, the United States--does show a retardation, i.e. a decline in the rate of growth. But the retardation in Sweden is quite minor, in Denmark and Canada there is no definite evidence of it, and in Ireland and Eire, Germany before World War I, Italy, and Japan there is some evidence of acceleration. Thus the finding certainly does not confirm our expectation that the rate of growth of population would show a substantial decline.

The reasons for the showing are probably different for the different countries, and it would take me far afield and beyond the level of my competence to discuss them in detail. For Ireland and Eire, since the acceleration represents the slowing down of a decline, it does not constitute a major problem, nor does it necessarily contradict our expectations. The absence of retardation in Denmark and the presence of some acceleration in pre-World War I Germany, in Italy, and in Japan, may be associated partly with the decline in emigration from the former as well. Furthermore, Japan may still be in the earlier phases of the long secular population swing, with declines in death rates still outpacing those in birth rates, and the rates of natural increase therefore still rising.

But these are all ad hoc suggestions, that will be useful only if they can be followed by scrutiny of the directly involved demographic determinants. The relevant point here is that our hypothesis assumes that there are different phases in the long secular swing in population growth rates, reflected in acceleration, constancy, or retardation. Incorporating international migration flows into the hypothesis would have only produced a greater variety of patterns. Hence, a finding of acceleration, retardation, or constancy in the rate of growth of population will depend upon the composition of our sample, i.e. upon the selection of countries and phases in which they may be during the period of coverage. That we found distinct evidence of retardation in the rate of population growth in only four of the ten countries covered may be due to the fact that only those four countries in our sample are in this phase of the long secular swing in demographic growth. It does not preclude the likelihood that other countries will enter this phase (or may have already done so, e.g. Germany and Japan).

(B) There is more evidence in the sample in Table 9 of retardation in the rate of growth of total product. It is found in the United Kingdom, France, Germany (pre-World War I, and probably later too), Denmark, the United States--in both net national product and product gross of capital consumption and all purchases of goods by governments--and Japan. There is some semblance of retardation in Canada and Italy, but the evidence is not convincing. Acceleration in the rate of growth of total product is found definitely in Ireland and Eire and Sweden.

(C) We also find retardation in the rate of growth in product per capita, in several countries. But the evidence is not as impressive as that for

retardation in the rate of growth of total product. In the United Kingdom, the means for the two subperiods decline, but those for the three subperiods cast some doubt upon this finding, at least for the period covered by our series. There is a retardation in the rate of growth of per capita product in Ireland and Eire, but it is too slight to be impressive. Neither can a substantial case be made for France or Canada. The two definite cases of retardation in the rate of growth of per capita product are those for pre-World War I Germany, and the United States. In Sweden we find acceleration, and there is some slight evidence of it in Italy. In Japan and Denmark the retardation indicated is probably due to the depressing effects of World War II.

These findings suggest the interesting implication that in several countries--the United Kingdom, France, and the United States--a significant retardation in the rate of growth of population is associated with a retardation in the rate of growth of total product, but not with a clear-cut tendency of the rate of growth in per capita product to decline. Here again the results may be due to the phases of the long secular swing in which we find the countries in our sample. It was suggested above that there may be significant differences in the timing of the secular swing in the rates of growth of population, per capita product, and hence also of total product: the upsurge in population growth may come first, that in the growth of per capita product may follow with a considerable lag, and that in the growth of total product may fall between but close to that in population growth. Accordingly, there may be similar lags in the entry into the retardation phase: population growth may begin to decline first, that of total product shortly thereafter, and that in per capita product last of all. If this hypothesis is valid, and at the present stage of our knowledge it is little more than a reasonable guess, it explains why so few countries in our sample show retardation in the rate of growth of per capita product.

Our interest in this characteristic of the underlying secular trends is partly due to the desire to deal with the long swings in the decadal rates of growth, unaffected by the longer-term processes of acceleration and retardation. However, before we decide to adjust for the latter, we should be reasonably sure that the cases of retardation or acceleration are significant enough to warrant further manipulation of the data at the cost of possible distortion of the variability in the decadal rates of growth. In general, such adjustments should be minimized, and not undertaken unless there is a strong case for them.

It is for this purpose that Table 10 has been devised. Here we observe the moving averages of decadal rates of growth to ascertain whether they consistently show the movement suggested by the findings in Table 9. A case for retardation or acceleration is strong if the moving averages of decadal rates move consistently, down in the former case or up in the latter.

In a few cases only, marked by asterisks in Table 10, is the drift of the moving averages of decadal rates sufficiently consistent down or up to justify a finding of retardation or acceleration--again, as always, within the limits of our sample of countries and periods. This is true of the retardation in the rates of population growth in the United Kingdom and in the United States, and of the acceleration in those of Ireland and Eire and Japan; of the retardation in the rates of growth of both total and per capita product in pre-World War I Germany, and in the rate of growth of net national product in the United States. This does not mean that in the other cases the indications of retardation or acceleration suggested by Table 9 are denied or without interest. It means only that the available evidence does not warrant further manipulation of the decadal rates of change, before studying their variability.

TABLE 10.--Consistency of Movement of Moving Averages of Decadal Rates of Growth, Population, National Product, and Product per Capita, Constant Prices, Selected Countries Used in Table 9

		Population		Total Product		Product per Capita	
Country	Number of Changes in Moving Averages	Direction of Trend Shown in Table 9	Number of Changes in Opposite Direction	Direction of Trend Shown in Table 9	Number of Changes in Opposite Directoin	Directoin of Trend Shown in Table 9	Number of Changes in Opposite Direction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
United Kingdom	11	decline	1*	decline	4	decline	6
Ireland & Eire	5	rise	1*	rise	2	decline	2
France	7	decline	3	decline	3	decline	3
Germany	3	rise	0*	decline	0*	decline	0*
Denmark	9	indeter-minate	+4	decline	4	decline	3
Sweden	11	decline	$5\frac{1}{2}$	indeter-minate	+6	rise	5
Italy	7	rise	4	decline	4	decline	4
United States, net national product	9	decline	0*	decline	1*	decline	4
United States, gross national product	9	decline	0*	decline	3	decline	4
Canada	9	indeter-minate	+5	decline	3	decline	4
Japan	7	rise	1*	decline	4	decline	2

Rise (Columns 2, 4, 6) means acceleration and decline means retardation of the long term rate of change.

*Retardation or acceleration acceptable by consistency criteria.

IX. Variations Over Time: Long Swings in the Rates of Growth

We can analyze the long swings in the rates of growth for only eight of the ten countries discussed in the preceding section. For Ireland and Eire and France the long-term records are not continuous enough for analysis. For those countries and aspects for which no significant case of retardation or acceleration of the rate of growth was found, the entries in Table 11 are absolute deviations of the rate of change for the given interval from the arithmetic mean of decadal rates of growth for the entire period. (Since I am using arithmetic means here, there are slight differences between them and the geometric means for identical periods given in Tables 1-3.)

Where a strong case for acceleration or retardation was found in Table 10, the deviations in Table 11 are from ordinates interpolated between properly centered arithmetic means for subperiods (from Table 9). These ordinates were interpolated between the means, for either two or three subperiods (if the latter were available) and extrapolated toward the ends of the series by the rates established in the neighboring interpolated segments. This is a crude procedure, but the character of the data neither warrants nor permits a more elaborate means of eliminating the underlying primary secular movement.

The entries in Table 11 are thus absolute differences between two sets of percentage rates of growth: the minuend, the rate of growth for successive decades, overlapping at five year intervals; and the subtrahend, the average rate of growth over a much longer period, either constant or uniformly accelerating or decelerating. The difference, if positive, indicates that over the given interval the decadal rate of growth is higher than the long term rate characterizing the particular process; if negative, that, over the given interval, the decadal rate of growth is lower than the long term rate.

The fluctuations over time in these deviations of decadal rates of growth either from the average rate for the period as a whole, or from the trend in the rates, are fairly substantial. From the nature of the case, these deviations are fluctuating movements: if they had been consistently in one direction, they would have constituted a strong case for either acceleration or retardation, and would have been eliminated by the technique just described.

There has been some discussion in the literature of this type of movement under different names[9]. But because adequate records for the analysis of such movements are hard to come by, our knowledge of their incidence and characteristics is still very meager. In the analysis of our records we are skating on thin ice, since some of the estimates may not be reliable enough to provide true indications of these long swings, and since it is impossible here to subject the findings to a thorough check for consilience with the results of other studies in the field.

In Table 11 I marked the peaks and troughs of these long swings in order to date the expansion and contraction phases. It should be noted in this connection that the rate of change over any one interval was centered in the middle; and

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[9] See my Secular Movements in Production and Prices, Houghton Mifflin, 1930--where they were called "secondary secular movements"; Arthur F. Burns' Production Trends in the United States Since 1870, National Bureau of Economic Research, 1934--where they were called "trend cycles"; and more recently Brinley Thomas" Migration and Economic Growth, Cambridge University Press, England, 1954, and W. Arthur Lewis' "Secular Swings in Production and Trade," Manchester School of Economic and Social Studies, Vol. XXIII, May 1955, to name a few.

the two years appearing as headings of columns 1-6 are the rough centers of intervals which, when the underlying data are for years ending in decades, run either from years ending in 0 through 9 and 5 through 4 (overlapping) or from 9 through 8 and 4 through 3 (overlapping). In identifying peaks and troughs, I have, in general, followed two criteria. First, since these are decadal rates at fair distances from each other (usually five years, except for the last which is somewhat longer), even a short break in the movement was considered significant and recognized as a distinct phase in the variations. Second, it is not quite legitimate to establish peaks and troughs at the ends of series, since the turning points may have come before the beginning or after the end of the series. But since available records are already far too short for our purposes, and strict adherence to the rule would have reduced appreciably the number of cases that we can cover, I did set such dates wherever the evidence was sufficiently impressive. By referring to Table 11, the critical reader can decide for himself whether too many liberties have been taken; and enter the corresponding changes in the results.

Table 11 is an assembly of raw evidence, and is useful largely in the study of variations in the specific rates of secular growth: it does not easily reveal the general characteristics of the long swings. The relevant summary measures are provided in Table 12. However, since it is based on Table 11 any changes in the latter would modify it.

Using Table 12 and with some reference back to Table 11, we can now attempt to summarize findings relating to (A) duration, (B) timing, and (C) amplitude of the variations in rates of secular growth.

(A) Columns 5 and 6 of Table 12 suggest that the long swings from trough to trough or from peak to peak are either from 4 to 5 quinquennia in duration or, almost double in length, from 7 or 8 to 10 quinquennia. In other words, these swings are either twenty to twenty-five years or forty to fifty years in duration. There seems to be no consistency in the distribution, i.e. no reasonable association between differences in duration and other characteristics--which may well be due either to the scantiness of our sample or to the arbitrary dating of these swings.

(B) If only because of these differences in duration, we cannot expect a notable coincidence in timing--particularly among countries. Yet some semblance of order in this aspect of the movement can be discerned.

First, since the amplitude of movements in the rates of growth of per capita product is far wider than that in rates of population growth, the pattern of movements in the former is impressed upon movements in the rates of growth of total product. Therefore, the turning points in the long swings of the two product series for any one country are parctically identical.

Second, for a few countries there seems to be positive association in the timing of the long swings in the rates of growth of product and of population--with Germany a significant exception. Thus in the United States, the turning points in the movements of population growth tend to follow, with a lag of one quinquennium--suggesting an association discussed in another connection in a paper by myself and Ernest Rubin.[10] This is partly true of Canada also. In one country, pre-World War I Germany, there seems to be an inverted relationship between the movements in the rate of population growth and in the rate of growth of product. In short, while there is some tendency toward association in the timing of long swings, in rates of growth of population and of product, it

[10] See Simon Kuznets and Ernest Rubin, Immigration and the Foreign Born, Occasional Paper 46, National Bureau of Economic Research, 1954, particularly, pp. 28-34.

TABLE 11.--Deviations of Decade Rates of Change from Average Rate for Total per Capita, Constant Prices,

Country	Mid-dates of intervals over which						
	1868-69	1873-74	1878-79	1883-84	1888-89	1893-94	1898-99
United Kingdom	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Population(*)	-0.8(t)	0.3(p)	0.3	-0.1(t)	0.6	1.7	2.1(p)
National Product	-3.3(t)	-0.6	8.1	15.9(p)	15.2	7.4	-2.5
Product per Capita	-6.6(t)	-4.8	3.6	11.8(p)	11.0	3.7	-4.9
Germany							
Population(*)	0.3	0.7(p)	0.2	-1.1(t)	-1.0	0.3	0.9(p)
National Product(*)	-18.0(t)	-1.5	7.0	12.5(p)	5.8	-5.0(t)	-3.4
Product per Capita	-16.7(t)	-2.3	6.1	12.8(p)	6.0	-5.1(t)	-4.0
Denmark							
Population			-0.8	-1.3	-1.8(t)	-0.9	0.8
National Product			-9.7(t)	-6.1	1.6	8.0	10.6
Product per Capita			-8.0(t)	-4.2	3.4	7.9	8.7
Sweden							
Population	0.3	1.1(p)	0.8	-1.0	-1.4(t)	-0.1	0.8
National Product	7.6(p)	2.2	-9.8	-12.7(t)	-4.8	6.1	7.7(p)
Product per Capita	6.8(p)	0.1	-10.3	-10.6(t)	-2.7	5.6	5.9(p)
Italy							
Population	-0.1(t)	-0.1	-0.1	-0.1	-0.1	-0.1	0.1
National Product	-7.7	-12.3(t)	-6.5	2.9(p)	-5.4(t)	-4.7	8.7
Product per Capita	-7.1	-11.5(t)	-6.1	2.7(p)	-5.0(t)	-4.5	7.9
United States, N.N.P.							
Population(*)			0.3	1.1(p)	0.5	-1.4(t)	-1.2
National Product(*)			24.4(p)	-6.9	-19.9(t)	-6.6	10.4(p)
Product per Capita			30.9(p)	2.4	-9.9(t)	0.3	12.1(p)
Canada							
Population			-3.5	-5.7	-7.1(t)	-5.6	2.1
National Product			18.5(p)	-1.2	-15.4(t)	-12.2	5.7
Product per Capita			19.2(p)	4.3	-6.8	-4.6	2.5
Japan							
Population(*)					-0.3	-1.1(t)	0.3
National Product					9.3	18.5(p)	4.3
Product per Capita					10.6	18.9(p)	4.2

*Deviations from trend derived from arithmetic means for 3 (or 2) subperiods

(p) and (t) designate the peaks and troughs in the long swings observed in

Period, or from Underlying Trend Lines (*), Population, Total Product and Product
Selected Countries

decade rate of change is calculated

1903-04	1908-09	1913-14	1918-19	1923-24	1928-29	1933-34	1938-39	1945-46
(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
1.6	0.5	-4.7(t)	-1.9	1.7(p)	-1.4(t)	-0.5	0.3	0.4(p)
-5.2	-10.2	-22.5(t)	-14.4	-0.6	1.0	8.5(p)	2.7	1.0
-6.4	-9.3	-15.6(t)	-10.0	-0.1	5.1	12.0(p)	6.0	4.9
-0.3								
2.8								
3.1								
1.4	1.0	3.3	5.9(p)	2.0	-2.6	-3.3(t)	-2.6	-1.3
11.5(p)	10.6	5.4	2.7(t)	6.3(p)	4.3	-14.3	-26.2(t)	-4.6
9.0(p)	8.4	1.0	-3.5(t)	3.6	6.8(p)	-9.4	-21.3(t)	-2.8
0.9	1.2(p)	0.8	-0.4	-1.8	-2.9	-3.0(t)	-1.0	5.9(p)
5.9	2.7	-9.3	-17.0(t)	-11.2	-2.5	1.9	7.1	25.7(p)
3.9	1.3	-9.6	-15.9(t)	-8.6	1.3	5.3	7.7	20.6(p)
0.9	1.0(p)	-1.8	-2.9(t)	-0.2	1.1	0.7	0.5	0.5
14.2(p)	-0.4	-7.2(t)	20.6	24.1(p)	-1.3	-7.7	-24.2(t)	7.4
12.1(p)	-1.5	-5.1(t)	22.8(p)	22.7	-2.4	-8.0	-23.2(t)	6.2
0.9	1.5(p)	-0.3	-1.1(t)	-0.3(p)	-1.7	-3.1(t)	-1.0	5.8(p)
7.4	-5.2	-9.6(t)	4.1(p)	-2.8	-26.8(t)	-11.5	21.0	21.4(p)
4.8	-8.4	-11.9(t)	0.3(p)	-6.2	-26.5(t)	-11.7	15.9(p)	8.3
12.1(p)	11.4	4.0	1.1	0.5	-2.3	-5.6(t)	-5.0	3.5
21.8(p)	12.7	-14.6	-20.7	-21.7	-33.8(t)	4.7	46.5(p)	9.8
5.6(p)	-0.9	-16.0	-18.7	-18.9	-26.9(t)	10.0	46.6(p)	4.3
1.1	1.2(p)	0.7	-1.3(t)	-0.6	1.7(p)	0.4	-3.3(t)	1.2
-11.6(t)	-8.2	-1.0	9.7	21.1(p)	18.7	5.8	-31.0	-35.7(t)
-11.1(t)	-8.5	-1.6	10.0	13.3(p)	13.7	3.8	-25.3	-33.9(t)

extrapolated and interpolated along a straight line.

Table 11.

TABLE 12.--Measures of Variability and Characteristics of Long Swings in Decade Selected Countries

Country and Period	Arithmetic Means of Decadal Rates	Average Deviation	Number of Long Swings		Average Duration in Quinquennia	
			Trough to Trough	Peak to Peak	Trough to Trough	Peak to Peak
	(1)	(2)	(3)	(4)	(5)	(6)
United Kingdom, 1860-1953						
Population (trend)	8.2	1.2	3	3	4	4.5
Total Product	21.7	7.4	1	1	9	10
Product per Capita	12.5	7.2	1	1	9	10
Germany, 1860-1914						
Population (trend)	11.6	0.6	0	1	-	5
Total Product (trend)	37.3	7.0	1	0	5	-
Product per Capita (trend)	23.3	7.0	1	0	5	-
Denmark, 1870-1954						
Population	11.6	2.1	1	0	9	-
Total Product	30.4	8.7	2	1	6	4
Product per Capita	16.8	7.0	2	1	6	5
Sweden, 1861-1954						
Population	6.6	1.5	1	2	9	7.25
Total Product	34.4	8.4	1	2	7	7.75
Product per Capita	26.2	7.3	1	2	7	7.75
Italy, 1862-1954						
Population	6.9	0.6	1	1	10	4
Total Product	16.5	9.7	3	2	4.3	4
Product per Capita	9.1	9.3	3	2	4.3	3.5
United States, N.N.P., 1869-1954						
Population (trend)	17.4	1.4	2	3	4	4.17
Total Product (trend)	40.4	12.7	2	3	4	4.5
Product per Capita	19.3	10.7	2	3	4	4
Canada, 1870-1954						
Population	18.1	5.0	1	0	9	-
Total Product	41.8	17.1	1	2	8	6
Product per Capita	20.2	13.2	1	2	8	6
Japan, 1878-1954						
Population (trend)	12.3	1.1	2	1	4.5	44
Total Product	46.3	14.6	1	1	8.5	6
Product per Capita	30.3	13.4	1	1	8.5	6

Rates of Change, Population, Total Product, and Product per Capita, Constant Prices, (Used in Table 11)

Average Total Amplitude		Average Amplitude per Quinquennium	Measures of Relative Variability	
Trough to Trough	Peak to Peak	$\left(\frac{\text{Col. 7}}{\text{Col. 5}} + \frac{\text{Col. 8}}{\text{Col. 6}}\right) \div 2$	$\frac{\text{Col. 2}}{\text{Col. 1}}$	$\frac{\text{Col. 9}}{\text{Col. 1}}$
(7)	(8)	(9)	(10)	(11)
5.3	4.8	1.2	0.15	0.15
41.7	46.9	4.7	0.34	0.22
34.0	39.4	3.9	0.58	0.31
-	2.7	0.5	0.05	0.04
35.5	-	7.1	0.19	0.19
34.6	-	6.9	0.30	0.30
11.0	-	1.2	0.18	0.10
29.6	20.5	5.0	0.29	0.16
26.0	19.3	4.1	0.42	0.24
5.6	6.9	0.8	0.23	0.12
37.4	39.2	5.2	0.24	0.15
32.4	32.8	4.4	0.28	0.17
4.0	5.0	0.8	0.09	0.12
34.3	34.0	8.2	0.59	0.50
30.8	29.9	7.8	1.02	0.86
4.2	5.4	1.2	0.08	0.07
40.2	43.7	9.9	0.31	0.25
36.3	40.0	9.5	0.55	0.49
24.8	-	2.8	0.28	0.15
71.0	78.9	11.0	0.41	0.26
39.3	55.4	7.1	0.65	0.35
5.0	4.2	1.1	0.09	0.09
68.4	51.2	8.3	0.32	0.18
64.3	49.3	7.9	0.44	0.26

is not too clear; nor is it always positive. It may well be that different conditions and phases affect the relationship and that the former are sufficiently varied within the sample of countries and periods covered here to bar any simple and determinate set of findings.

Third, there is some evidence of an internationally common chronology in the variations in the rates of growth of product--but not of population. The following tabulation relating to rates of growth of product is suggestive:

Peak in 1878-79 or 1883-84	Trough in 1888-89 or 1893-94	Peak in 1898-99 or 1903-04	Trough in 1913-14	Peak in 1945-46
United Kingdom	Germany	Germany (probable)	United Kingdom	Sweden
Germany	Italy	Denmark	Germany (probable)	United States
Italy	United States	Italy	Italy	
United States	Canada	United States	United States	
Canada		Canada		
		Sweden		

There seemed to be a tendency toward high rates of growth in product from the 1870's to the 1880's; toward low rates from the 1880's to the 1890's; toward high rates from the 1890's to the first decade of the twentieth century; and then toward low rates again in the World War I decade. Interestingly enough, there was much less consilience of movements within our sample of countries with the onset of World War I. Some countries prospered during the war, others were greatly depressed by it. And significantly enough, this disparity persisted through the 1920's and the 1930's--despite the internationally widespread depression of the 1930's.

It need not be stressed that both the agreement in the decades before t World War I and the lack of it in the subsequent decades have been found for only a few countries. Any broader list of common dates in the long swings or rates of growth must await a supply of long-term continuous records for many more countries.

(C) The measures of amplitude indicate clearly that the varaitions in rates of secular growth are far from negligible. One measure completely independent of dating is provided by the average deviation (Table 12, column 2) which is compared in column 10 with the average rate of decadal change (column 1), the ratio of the deviation to the mean being given in column 11. While the average deviations in the rate of population growth are moderate, those in the rate of growth of product--particularly product per capita--are quite substantial. In six of the eight countries the deviations from the average rate of growth in per capita product are more than 40 percent of the average rate--meaning that, by and large, the rate of growth for any one decade interval exceeds or falls short of the average by a substantial fraction.

The total amplitude of the long swings--either from a low point to the next high, and to the next low; or from a high point to the next low, and to the next high--would also loom large in comparison with the average decadal rate of growth--and to a greater extent for the product series than for the population series. Even on a per quinquennium basis, the movements of the rates of growth constitute sizeable fractions of the average decadal rates for the period as a whole (Table 12, column 1). In short, we are dealing here with variations which, at least in the case of the product series, are quite large compared with the average rates of growth--so that any changes that they imply in the rapidity of growth

from one decade interval to the next constitute a quantitatively important element in the process. Even the movements in the rates of population growth, while not as wide as in the case of product, are not insignificant.

There are, however, substantial differences in the amplitude of these movements among the several countries. Disregarding pre-World War I Germany, in which the adjustment for trend reduces the amplitude of movements appreciably, we find that such deviations from the average rate of growth of product have the narrowest relative amplitude in Sweden and the widest in Italy. Both cases deserve further careful study. Two other countries, Denmark and Canada, show rather wide relative amplitudes of variations in the rates of growth of population as Sweden does, but there the significance of a high ratio in column 10 is reduced because of the low level of the average rate of growth in column 1. It may well be that in small countries there is a tendency for the rate of population growth to vary more than in large countries--but our sample is too small to warrant even speculative generalizations.

In concluding this brief and tentative discussion of the long swings in the rates of growth, it may be useful to comment upon the importance of segregating them for separate study. Of course, these movements are an abstraction; but so are the average rates of growth, and the measures of retardation or acceleration in the rates of growth. They are all aspects of one and the same process of change that are distinguished in order to permit the observer to find testable similarities and differences in behavior of economic and social processes. These testable similarities and differences may, in turn, lead to the identification of distinct groups of factors that may facilitate the task of explanation and generalization. For example, if we segregate the long swings in the rate of growth of population in the United States and find that, up to World War I they were clearly associated with similar movements in gross and net immigration, we are much further along in our understanding of the process of population growth in this country--whether or not we can claim this to be a genuinely "recurrent" movement and hence a long "cycle."

These long swings are quite different in time pattern from either the average rate or the average modified by an acceleration or retardation constant; and their measurable amplitudes are quite substantial, either absolutely or relatively to the average level of long-term primary secular growth. Similar long swings are, in all probability, present in a wide variety of aspects of the economy. If so, they should be studied separately since the relations among the various economic processes--production, distribution, consumption, etc., of various commodities and services--as they go through these movements may well be different from those in short-term variations such as business cycles, or in the longer-term levels of average rates of growth, or of acceleration and deceleration. We should accept these long swings as an analytically important component in the study of secular changes or of processes of growth in general; and by analyzing them attempt to supplement our knowledge of their observable and measurable characteristics.

Appendix. Reference Tables on Population and National Income, Nineteen Countries

The reference tables, assembled in this Appendix, provide the minimum amount of data relating to the long-term record of population and national income or product for nineteen countries for which such records are presently available.

In general, the absolute figures are shown in terms of averages for successive decades overlapping by five years. Time units other than decades are employed occasionally, either to secure a roughly standard dating of decades for all countries or to distinguish a recent period, relatively free from the immediate effects of World War II.

For countries for which continuous and long records are available, the absolute figures are supplemented by calculated percentage changes per decade and moving averages of the latter. These derivative figures may be useful, particularly since they are employed in the analysis in the text.

The notes to the tables are limited to indications of sources and of any particular manipulations or combinatoins that had to be made to secure comparable and continuous records. It is impossible to give even a brief account here of how the estimates were derived. To familiarize oneself with the methods, one would have to scrutinize the original sources from which the series were taken, and supplement them by further search and perhaps even by direct contact with the authors. The notes provided here are intended merely as indications of sources from which the figures were taken; and hence guides as to where further information concerning these estimates can be found.

Appendix Table 1

Population and Net National Income, Total and per Capita, Current and 1912-13 Prices, United Kingdom, 1860-1953

A. Absolute Figures

Periods	Population (million)	Net National Income Current Prices (billion pounds)	Price Index (1912-13 = 100)	Net National Income 1912-13 Prices (billion pounds)	Net National Income per Capita 1912-13 Prices (pounds)
	(1)	(2)	(3)	(4)	(5)
1. 1860-69	25.8			788	30.5
2. 1870-79	28.9	1028	110.2	933	32.3
3. 1875-84	30.7	1071	103.2	1038	33.8
4. 1880-89	32.2	1135	93.7	1211	37.5
5. 1885-94	34.0	1252	87.7	1428	42.0
6. 1890-99	35.8	1421	85.7	1658	46.3
7. 1895-1904	37.8	1603	86.9	1845	48.8
8. 1900-09	39.7	1801	91.1	1977	49.8
9. 1905-14	41.5	2047	95.2	2150	51.8
10. 1910-19	42.9	2975	134.9	2205	51.4
11. 1915-24	42.5	3970	186.1	2133	50.2
12. 1920-29	44.9	4299	181.7	2366	52.7
13. 1925-34	45.8	4011	155.3	2583	56.4
14. 1930-39	46.8	4280	147.5	2902	62.0
15. 1935-44	47.9	6117	181.9	3363	70.2
16. 1940-49	49.1	8330	230.8	3609	73.5
17. 1945-52	50.0	10,186	275.3	3700	74.0
18. 1949-53	50.4			4254	84.4

Excludes Southern Ireland.

Appendix Table 1

B. Percentage Changes for Decade

Intervals	Population		Net National Income 1912-13 Prices		Net National Income per Capita, 1912-13 Prices	
	Percent Change per Decade	7 Item Moving Average of Col. 1	Percent Change per Decade	7 Item Moving Average of Col. 3	Percent Change per Decade	7 Item Moving Average of Col. 5
	(1)	(2)	(3)	(4)	(5)	(6)
1860-69 to 1870-79	12.0		18.4		5.9	
1865-74 to 1875-84[a]	12.4		21.1		7.7	
1870-79 to 1880-89	11.8	(11.5)	29.8	(28.8)	16.1	(15.5)
1875-84 to 1885-94	10.7	11.4	37.6	27.5	24.3	14.5
1880-89 to 1890-99	10.8	11.1	36.9	27.2	23.5	14.5
1885-94 to 1895-1904	11.2	10.5	29.2	25.8	16.2	13.9
1890-99 to 1900-09	10.9	9.1	19.2	21.4	7.6	11.1
1895-1904 to 1905-14	9.8	8.3	16.5	17.1	6.1	8.0
1900-09 to 1910-19	8.1	7.8	11.5	14.9	3.2	6.4
1905-14 to 1915-24	2.4	6.8	-0.8	13.9	-3.1	6.6
1910-19 to 1920-29	4.7	5.9	7.3	15.5	2.5	9.0
1915-24 to 1925-34	7.8	5.2	21.1	16.6	12.4	10.8
1920-29 to 1930-39	4.2	4.7	22.7	18.2	17.6	12.8
1925-34 to 1935-44	4.6	(5.2)	30.2	(24.2)	24.5	(18.1)
1930-39 to 1940-49	4.9		24.4		18.5	
1935-44 to 1949-53	4.5		22.7		17.4	

[a] 1865-74 values interpolated along a logarithmic straight line between the values for 1860-69 and 1870-79 given in Part A.

Figures in praentheses are arithmetic means for the first and last group of 5 items each.

Notes to Appendix Table 1, Part A

Column 1

Line 1: From Robert R. Kuczynski, The Measurement of Population Growth (London, 1936), p. 230, with two adjustments: (1) the estimate for the 0-9 decade was derived by straight line interpolation between Kuczynski's estimates for the 1-5 and 6-10 quinquennia, and (2) the estimate for the population of Southern Ireland was derived on the basis of its percentage of the total for all Ireland in 1911-14, from the same source.

Lines 2-10: From James B. Jefferys and Dorothy Walters, "National Income and Expenditure of the United Kingdom, 1870-1952," Income and Wealth, Series V (Bowes and Bowes for International Association for Research in Income and Wealth, 1956), Table III, p. 14. The reported figures were adjusted to exclude the population of Southern Ireland by the procedure described for line 1.

Line 11: Average of annual estimates given in Henri Bunlé, Le Mouvement Naturel de la Population dans le Monde de 1906 à 1936 (Paris, 1954) Table I.

Lines 12-17: From ibid.

Line 18: From U.N. Demographic Yearbook, 1954, Table 3.

Column 2

Column 3 multiplied by column 4.

Column 3

The price index implicit in net national income derived by dividing the averages of annuals given in Jefferys and Walters, op. cit., Table I, p. 8, column 2, by the product of columns 2 and 4 in ibid., Table III, p. 14.

Column 4

Line 1: Extrapolated by the estimate in Colin Clark, Conditions of Economic Progress (2nd Ed., London, 1951), p. 62.

Lines 2-17: Product of columns 1 and 5.

Line 18: From columns 2 and 4 of Jefferys and Walters, op. cit., Table VI, p. 17 for 1948-52 extrapolated to 1949-53 by the series in the U.N. Statistical Paper, Series H, No. 8, Table 2.

Column 5

Line 1: Column 4 divided by column 1.

Lines 2-10: From Jefferys and Walters, op. cit., Table III, column 4, adjusted to exclude Southern Ireland. For this adjustment it was assumed that the per capita income in Southern Ireland was one-half of the per capita income of the United Kingdom including Southern Ireland. For the basis of this assumption see Colin Clark, op. cit., pp. 60, 61 and 63.

Line 11: The figure in Jefferys and Walters, op. cit., is based on data including Southern Ireland for 1915-19. To adjust we again assumed the per capita income in Southern Ireland was one-half that in the United Kingdom including Southern Ireland and estimated the latter for 1915-19 by applying to Jefferys' figure for 1915-24 the ratio of the average for 1915-19 to that for 1915-24 given in A. R. Prest, "National Income of the United Kingdom, 1870-1946," Economic Journal, March 1948, Table II, p. 58.

Lines 12-17: From Jefferys and Walters, op. cit., Table III, column 4.

Line 18: Column 4 divided by column 1.

Appendix Table 2

Population and National Income, Total and per Capita, Constant Prices, Ireland and Eire, 1860-1953

A. Absolute Figures

	Population (millions)	National Income Constant Prices (Billion I.U.)	National Income per Capita Constant Prices (I.U.)
	(1)	(2)	(3)
All Ireland			
1. 1860-69	5.60	0.598	107
2. 1870-76	5.34	0.626	117
3. 1877-85	5.14	0.719	140
4. 1885-93	4.77	0.759	159
5. 1894-1903	4.50	0.836	186
6. 1904-13	4.38	0.969	221
7. 1913	4.38	1.026	234
Eire			
8. 1911	3.13	0.64	205
9. 1926	2.97	0.87	292
10. 1929-38[a]	2.95	0.92	313
11. 1934-43	2.96	0.89	302
12. 1949-53	2.96	1.09	367

[a] No income data available for 1930.

Appendix Table 2

B. Percentage Changes per Decade

Intervals	Population		National Income Constant Prices		National Income per Capita Constant Prices	
	Percent Change per Decade	3 Item Moving Average of Col. 1	Percent Change per Decade	3 Item Moving Average of Col. 3	Percent Change per Decade	3 Item Moving Average of Col. 5
	(1)	(2)	(3)	(4)	(5)	(6)
All Ireland						
1860-69 to 1870-76	-5.4		5.5		11.1	
1870-76 to 1877-85	-4.7	-6.3	18.9	10.5	25.1	17.8
1877-85 to 1885-93	-8.9	-6.5	7.0	12.2	17.2	20.1
1885-93 to 1894-1903	-6.0	-5.9	10.7	11.2	17.9	18.0
1894-1903 to 1904-13	-2.7	-4.0	15.9	16.4	18.8	21.1
Eire						
1911 to 1926	-3.4	-2.1	22.7	13.5	26.6	16.0
1926 to 1934-43	-0.3	-1.2	1.8	14.0	2.7	15.4
1934-43 to 1949-53	0		17.6		16.9	

Notes to Appendix Table 2, Part A

Column 1

Line 1: Average of average for 1861-65 given in Kuczynski, op. cit., and annual estimates for 1866-69 given in Statistique Internationale du Mouvement de la Population, vol. 1, p. 4.

Lines 2-5: Average of annual estimates given in ibid.

Line 6: Average of annual estimates given in ibid., vol. 2, p. 4 and Bunlé, op. cit., Table 1.

Lines 7-9: From ibid.

Line 10: Average of annual estimates given in ibid. for 1929-36 and in the U.N. Demographic Yearbook, 1952, Table 3.

Lines 11-12: Average of annual estimates given in Bunlé, op. cit., and in the U.N. Demographic Yearbook, 1952, Table 3 and 1954, Table 2.

Column 2

Lines 1-7: From Colin Clark, op. cit., p. 70, with line 6 a weighted average of his estimates for 1904-10 and 1911-13.

Line 8: Column 1 multiplied by column 3.

Lines 9-11: From ibid., p. 60, with lines 10 and 11 averages of annual estimates.

Line 12: Extrapolated from 1938 by the series for private consumption expenditure given in the U.N. Statistical Paper, Series H, No. 8, Table 2.

Column 3

Lines 1-7, 9-12: Column 2 divided by column 1.

Line 8: Derived from the estimate for income per occupied person given in Clark, op. cit., and adjusted by the 1926 ratio of employed population, given in ibid., to total population.

Appendix Table 3

Population and Net National Product, Total and Per Capita, 1938 Prices, France, 1810-1953

	Population (millions)	Net National Product, 1938 Prices (billion francs)	Net National Product per Capita, 1938 Prices (francs)
	(1)	(2)	(3)
Excl. Alsace-Lorraine			
1. 1810-20	29.6	48.0	1,623
2. 1820-30	31.4	59.8	1,903
3. 1831-40	33.4	66.5	1,990
4. 1841-50	35.1	87.3	2,487
5. 1851-60	36.2	106.9	2,954
6. 1861-70	37.9	135.8	3,582
7. 1871-80	36.8	133.9	3,638
8. 1881-90	38.1	166.5	4,371
9. 1891-1900	38.6	202.1	5,236
10. 1901-10	39.3	242.4	6,168
Incl. Alsace-Lorraine			
11. 1901-10	41.1	253.5	6,168
12. 1911	41.5	273.9	6,600
13. 1913	41.7	334.4	8,018
14. 1920-28	40.1	331.4	8,265
15. 1924-33	41.2	391.4	9,499
16. 1929-38	41.7	385.8	9,252
17. 1934-43	40.5	317.2	7,833
18. 1939-48	39.7	269.4	6,785
19. 1944-53	41.1	337.1	8,203
20. 1949-53	42.2	408.7	9,684

B. Percentage Changes per Decade

Intervals	Population		Net National Product, 1938 Prices		Net National Product per Capita, 1938 Prices	
	Percent Change per Decade	3 Item Moving Average of Col. 1	Percent Change per Decade	3 Item Moving Average of Col. 3	Percent Change per Decade	3 Item Moving Average of Col. 5
	(1)	(2)	(3)	(4)	(5)	(6)
Excl. Alsace-Lorraine						
1841-50 to 1851-60	3.1		22.5		18.8	
1851-60 to 1861-70	4.7	1.6	27.0	16.0	21.3	13.9
1861-70 to 1871-80	-2.9	1.8	-1.4	16.6	1.6	14.3
1871-80 to 1881-90	3.5	0.6	24.3	14.8	20.1	13.8
1881-90 to 1891-1900	1.3	2.2	21.4	21.9	19.8	19.2
1891-1900 to 1901-10	1.8	1.7	19.9	24.2	17.8	22.2
Incl. Alsace-Lorraine						
1901-10 to 1911 & 1913	1.9	1.0	31.3	22.7	28.9	21.4
1911 & 1913 to 1924-33	-0.6	-0.1	16.9	9.7	17.6	9.7
1924-33 to 1934-43	-1.7	0.3	-19.0	6.8	-17.5	6.2
1934-43 to 1949-53	3.3		22.5		18.5	

Notes to Appendix Table 3, Part A

Column 1

Lines 1-10: From François Perroux, "Prises de Vues sur la Croissance de l'Economie Francaise, 1780-1950," Income and Wealth, Series V, Table V, p. 69.

Line 11: From Kuczynski, op. cit., p. 230.

Lines 12-20: Annuals or averages of annuals from Henri Bunlé, op. cit., Table 1 and the U.N. Demographic Yearbook, 1952, Table 3 and 1954, Table 2.

Column 2

Product of columns 1 and 3

Column 3

For 1938 the per capita income was derived by dividing total national income, given in the U. N. Statistical Paper, Series H, No. 8, Table 1 by total population, from the source cited in the notes to column 1. The 1938 per capita income was extrapolated by a linked index derived from the following sources:

Lines 1-11: Perroux, op. cit., Table V, p. 69. It was assumed that per capita income was the same in 1901-10, including and excluding Alsace-Lorraine.

Lines 11 & 12: Colin Clark, op. cit., p. 80. Income per occupied worker before imputation of retail prices to farm consumption was used as index; Clark's average for 1900-09 was linked to 1901-10, and his average for 1920-24 was linked to Svennilson's index for later years.

Lines 13-20: Ingvar Svennilson, Growth and Stagnation in the European Economy (Geneva, 1944), Table A.1, p. 233. The index is given for 1913, 1920-40, 1946-50. We estimated it for 1951-45 by dividing the index for total income, which Svennilson gives, by the index of population, derived from the source cited in the notes to column 1. For 1951-53 the index was derived by linking Svennilson's for 1949-50 to those given in the U.N. Statistical Paper, Series H, No. 8, Table 2.

Appendix Table 4

Population and National Income, Total and Per Capita, Current and 1928 Prices, Germany 1860-1954

A. Absolute Figures

	Population (millions)	National Income Current Prices (billion marks)	Price Index (1928 = 100)	National Income 1928 Prices (billion marks)	National Income per Capita 1928 Prices (marks)
	(1)	(2)	(3)	(4)	(5)
Territory before 1913					
1. 1860-69	39.2	10.67	59.8	17.84	455
2. 1865-74	40.7	11.70	58.2	20.09	494
3. 1870-79	42.4	13.59	56.3	24.15	569
4. 1875-84	44.6	15.97	54.0	29.60	663
5. 1880-89	46.7	18.95	51.9	36.51	782
6. 1885-94	49.0	22.80	50.7	45.01	920
7. 1890-99	51.9	26.20	51.0	51.41	991
8. 1895-1904	55.6	29.80	52.8	56.43	1015
9. 1900-09	59.8	35.41	56.3	62.91	1051
10. 1905-14	64.0	43.11	61.4	70.18	1096
Territory of 1925					
11. 1913	60.4	45.70	65.9	69.30	1162
12. 1925-34	64.1	60.88	90.6	67.17	1049
13. 1930-39	66.4	62.76	84.6	74.17	1117
14. 1935-41	68.6	80.30	86.5	92.88	1353
Western Republic					
15. 1936	39.4	37.70	82.9	45.50	1182
16. 1950-54	48.6			69.02	1414

Appendix Table 4

B. Percentage Rates of Change per Decade

Intervals	Population		National Income, 1929 Prices		National Income per Capita 1928 Prices	
	Percent Change per Decade	5 Item Moving Average of Col. 1	Percent Change per Decade	5 Item Moving Average of Col. 3	Percent Change per Decade	5 Item Moving Average of Col. 5
	(1)	(2)	(3)	(4)	(5)	(6)
Territory Before 1913						
1860-69 to 1870-79	8.2		35.4		25.1	
1865-74 to 1875-84	9.6		47.3		34.2	
1870-79 to 1880-89	10.1	9.8	51.2	45.4	37.4	32.4
1875-84 to 1885-94	9.9	10.8	52.1	43.4	38.8	29.5
1880-89 to 1890-99	11.1	12.0	40.8	38.4	26.7	23.9
1885-94 to 1895-1904	13.5	13.0	25.4	32.9	10.3	18.0
1890-99 to 1900-09	15.2		22.4		6.1	
1895-1904 to 1905-14	15.1		24.0		8.0	
Territory of 1925						
1913 to 1935-41	5.2		12.4		6.3	
Western Republic						
1936 to 1950-54	14.0		29.7		11.9	

Notes to Appendix Table 4, Part A

Column 1

Lines 1-10, 12, 13, 15: From Paul Jostock, "The Long-Term Growth of National Income in Germany," Income and Wealth, Series V, Table III, p. 94.

Line 11: The estimate given in Bunlé, op. cit., Table 1, adjusted by the ratio for 1911-14 of the estimate for the territory of 1911-14 to that for the territory of 1925 derived from figures given in Kuczynski, op. cit.

Line 14: Average of annual estimates given in Bunlé, op. cit., and the U.N. Demogrpahic Yearbook, 1952, Table 3.

Line 16: Average of annual estimates given in ibid., 1954, Table 2.

Column 2

From Jostock, op. cit., Table 1, p. 82.

Line 14: Average of estimates for the overlapping periods, 1935-37, 1937-39, and 1939-41.

Column 3

Column 2 divided by column 4.

Columns 4 and 5

Lines 1-15: From Jostock, op. cit., Table 1, p. 82, with line 14 again the average for overlapping periods.

Line 16: Average of annual estimates given for 1950-52 in Jostock, op. cit., Table 1, p. 82 and extrapolated for 1953-54 by the index of gross national product, total and per capita, given in U.N. Statistical Paper, Series H, No. 8, Table 2.

Appendix Table 5

Population and National Income, Total and Per Capita, Constant Prices
Switzerland, 1890-1953

	Population (millions)	National Income Constant Prices (Billion I.U.)	National Income per Capita Constant Prices (I.U.)
	(1)	(2)	(3)
1. 1890-99	3.12	0.63	203
2. 1913	3.86	1.06	274
3. 1924-33	4.01	1.49	372
4. 1929-38	4.12	1.57	380
5. 1934-43	4.21	1.54	365
6. 1939-48	4.36	1.62	372
7. 1944-53	4.61	1.95	422
8. 1949-53	4.76	2.16	453

Notes:

Column 1

Based on annual estimates given in Statistique Internationale du Mouvement de la Population, vol. 1, p. 19, vol. 2, p. 8, Bunlé, op. cit., Table 1, and the U.N. Demorgaphic Yearbook, 1952, Table 3 and 1954, Table 2.

Column 2

Line 1: From Clark, op. cit., p. 87; average of estimates for 1890, 1895, and 1899.

Lines 2-5: From ibid., with lines 3-5 averages of annual estimates.

Lines 6-8: Averages of annual estimates from ibid. for 1939-43, extrapolated by the series given in the U.N. Statistical Paper, Series H, No. 8, Table 2.

Column 3

Column 2 divided by column 1.

Appendix Table 6

Population and National Income, Total and per Capita, Current and 1938 Prices, Netherlands, 1900-1954

A. Absolute Figures

	Population (millions)	National Income Current Prices (Million guilders)	Price Index (1938 = 100)	National Income 1938 Prices (Million guilders)	National Income per Capita 1938 Prices (guilders)
	(1)	(2)	(3)	(4)	(5)
1. 1900-08	5.47	1.91	82.7	2.31	422
2. 1904-13	5.81	2.22	87.1	2.55	439
3. 1909-18	6.26	2.90	104.7	2.77	442
4. 1914-23	6.73	4.40	137.9	3.19	474
5. 1919-28	7.21	5.48	139.1	3.94	546
6. 1924-33	7.64	5.38	120.4	4.47	585
7. 1929-38	8.16	4.87	105.6	4.61	565
8. 1934-43	8.73	5.01	111.8	4.48	513
9. 1939-48	9.21	6.90	164.7	4.19	455
10. 1944-53	9.85	12.56	241.1	5.21	529
11. 1950-54	10.37	18.19	274.4	6.63	639

B. Percentage Changes per Decade

Intervals				
1900-08 to 1909-18	15.3		21.1	5.0
1904-13 to 1914-23	15.8		25.1	8.0
1909-18 to 1919-28	15.2		42.2	23.5
1914-23 to 1924-33	13.5		40.1	23.4
1919-28 to 1929-38	13.2		17.0	3.5
1924-33 to 1934-43	14.3		0.2	-12.3
1929-38 to 1939-48	12.9		-9.1	-19.5
1934-43 to 1950-54	13.6		33.7	17.7

Notes to Appendix Table 6, Part A

Column 1

Averages of annual estimates given in Het Nationale Inkomen van Nederland, 1921-1939, No. 7 der Monografieen van de Nederlandse Conjunctuur (Netherlands Central Bureau of Statistics, The Hague, 1948), Table 46, p. 51 and in the U.N. Demographic Yearbook, 1952, Table 3 and 1954, Table 2.

Column 2

Average of annual estimates given in Het Nationale Inkomen van Nederland, 1921-1939, Table 40, p. 46, for 1900-39 and in U.N. Statistical Paper, Series H, No. 8, Table 1 for 1940-54.

Column 3

Column 2 divided by column 4.

Column 4

Average of annual estimates derived by extrapolating the 1938 figure, given in ibid., Table 1, by the index of real national income. The latter as given in Het Nationale Inkomen . . ., Table 45, p. 50 is used for extrapolation back to 1900; and as given in U.N. Statistical Paper, Series H, No. 8, Table 2 for extrapolation forward to 1954.

Column 5

Column 4 divided by column 1.

Appendix Table 7

Population and Net Domestic Product, Total and Per Capita, Current and 1929 Prices, Denmark, 1870-1954

A. Absolute Figures

	Population (millions)	Net Domestic Product Current Prices (Billion Kroner)	Price Index (1929 = 100)	Gross Domestic Product 1929 Prices (Billion Kroner)	Net Domestic Product 1929 Prices (Billion Kroner)	Net Domestic Product per Capita, 1929 Prices (Kroner)
	(1)	(2)	(3)	(4)	(5)	(6)
1. 1870-78	1.86	0.63	61.9	1.08	1.02	549
2. 1874-83	1.95	0.68	61.4	1.18	1.11	571
3. 1879-88	2.05	0.72	58.7	1.31	1.22	595
4. 1884-93	2.15	0.80	57.6	1.49	1.38	643
5. 1889-98	2.25	0.93	57.5	1.74	1.61	715
6. 1894-1903	2.38	1.10	57.6	2.09	1.91	802
7. 1899-1908	2.53	1.33	58.4	2.50	2.27	897
8. 1904-13	2.69	1.61	59.6	2.85	2.71	1,009
9. 1909-18	2.85	2.79	87.1	3.22	3.20	1,123
10. 1914-23	3.09	4.97	135.0	3.94	3.68	1,189
11. 1919-28*	3.35	5.64	132.4	4.63	4.26	1,272
12. 1924-33	3.51	4.97	98.9	5.25	5.03	1,432
13. 1929-38	3.65	5.33	92.9	5.96	5.74	1,572
14. 1934-43	3.80	7.25	124.2	5.84	5.84	1,538
15. 1939-48	3.98	11.06	184.8	6.00	5.98	1,502
16. 1944-53	4.20	16.84	241.4	7.46	6.98	1,662
17. 1950-54	4.34	21.67	272.4	8.69	7.96	1,835

*North Schlesyig incorporated in 1920.

Appendix Table 7

B. Percentage Changes per Decade

Intervals	Population		Net Domestic Product 1929 Prices		Net Domestic Product per Capita 1929 Prices	
	Percent Change per Decade	7 Item Moving Average of Col. 1	Percent Change per Decade	7 Item Moving Average of Col. 3	Percent Change per Decade	7 Item Moving Average of Col. 5
	(1)	(2)	(3)	(4)	(5)	(6)
1870-78 to 1879-88	10.8		20.7		8.8	
1874-83 to 1884-93	10.3		24.3		12.6	
1879-88 to 1889-98	9.8	(10.8)	32.0	(31.3)	20.2	(18.4)
1884-93 to 1894-1903	10.7	11.4	38.4	34.2	24.7	20.4
1889-98 to 1899-1908	12.4	12.0	41.0	36.3	25.5	21.7
1894-1903 to 1904-13	13.0	13.0	41.9	37.6	25.8	21.8
1899-1908 to 1909-18	12.6	13.5	41.0	38.3	25.2	21.8
1904-13 to 1914-23	14.9	13.3	35.8	37.7	17.8	21.7
1909-18 to 1919-28	17.5	12.7	33.1	34.2	13.3	19.1
1914-23 to 1924-33	13.6	12.1	36.7	28.8	20.4	14.7
1919-28 to 1929-38	9.0	11.8	34.7	26.6	23.6	13.1
1924-33 to 1934-43	8.3	(10.0)	16.1	(23.5)	7.4	(12.2)
1919-38 to 1939-48	9.0		4.2		-4.5	
1934-43 to 1950-54	10.3		25.8		14.0	

Figures in parentheses are arithmetic means for the first and last groups of 5 items each.

Notes to Appendix Table 7, Part A

Column 1

Average of annual estimates given in Kjeld Bjerke, "The National Product of Denmark, 1870-1952," Income and Wealth, Series V, Table XIV, p. 151 for 1870-1952, in the U.N. Demographic Yearbook, 1952, Table 2 for 1953, and in the U.N. Statistical Paper, Series A, Vol. VII, No. 4, Table 1 for 1954.

Column 2

Average of annual estimates given in Bjerke, op. cit., Table X, p. 147 for 1870-1952 and extrapolated for 1953-54 by the series in the U.N. Statistical Paper, Series H, No. 8, Table 1.

Column 3

Column 2 divided by column 5.

Column 4

Average of annual estimates given in Bjerke, op. cit., Table X, p. 147 for 1870-1952, and extrapolated for 1953-54 by the series in the U.N. Statistical Paper, Series H, No. 8, Table 2.

Column 5

Average of annual estimates given in Bjerke, op. cit., Table X, p. 147 for 1870-1952 and extrapolated for 1953-54 by the series in the U.N. Statistical Paper, Series H, No. 8, Table 2.

Column 6

Column 5 divided by column 1.

Appendix Table 8

Population and Gross Domestic Product, Total and Per Capita, Current and 1938 Prices, Norway, 1900-1954

A. Absolute Figures

	Population (million)	Gross Domestic Product Current Prices (Billion Kroner)	Price Index (1938 = 100)	Gross Domestic Product 1938 Prices (Billion Kroner)	Gross Domestic Product per Capita 1938 Prices (Kroner)
	(1)	(2)	(3)	(4)	(5)
1. 1900-08	2.28	1.14	53.0	2.15	941
2. 1904-13	2.36	1.37	56.8	2.41	1022
3. 1909-18	2.46	2.57	91.1	2.82	1145
4. 1914-23	2.59	4.70	144.8	3.25	1253
5. 1919-28	2.71	5.34	146.5	3.64	1344
6. 1924-33	2.79	4.47	106.2	4.21	1508
7. 1929-39	2.87	4.68	91.6	5.11	1781
8. 1946-53	3.25	17.05	218.1	7.82	2409
9. 1950-54	3.33	21.62	251.5	8.60	2583

B. Percentage Changes per Decade

Intervals			
1900-08 to 1909-18	8.3	33.0	22.9
1904-13 to 1914-23	9.7	24.9	22.6
1909-18 to 1919-28	10.2	29.1	17.4
1914-23 to 1924-33	7.7	29.5	20.4
1919-28 to 1929-39	5.6	38.1	30.7
1929-39 to 1950-54	8.6	33.5	22.9

Notes to Appendix Table 8, Part A

Column 1

Average of annual estimates given in Statistique Internationale du Mouvement de la Population, Vol. 1 (Paris, 1907), p. 9 for 1900-04, in the Economic Survey, 1900-50 (Oslo, 1955), Table 1, p. 21 for 1905, in Bunlé, op. cit., Table 1 for 1906-1934, in the U.N. Demographic Yearbook, 1952, Table 3 for 1935-39, in ibid., 1954, Table 2 for 1940-53, and in the U.N. Statistical Paper, Series A, Vol. VII, No. 4, Table 1 for 1954.

Column 2

Average of annual estimates given in National Accounts, 1900-1929 (Central Bureau of Statistics, Oslo, 1953), Table 1, p. 104 for 1900-39 and 1946-50 and in the U.N. Statistical Paper, Series H, No. 8, Table 5 for 1951-54.

Column 3

Column 2 divided by column 4.

Column 4

Averages of annual estimates given in National Accounts, 1900-1929, Table 14, p. 128 for 1900-39 and 1946-50 and extrapolated for 1951-54 by the index given in U.N. Statistical Paper, Series H, No. 8, Table 2.

Column 5

Column 4 divided by column 1.

Appendix Table 9

Population and Gross Domestic Product, Total and Per Capita, Current and 1913 Prices, Sweden, 1861-1954

A. Absolute Figures

	Population (millions)	Gross Domestic Product Current Prices (Billion Kronor)	Price Index (1913 = 100)	Gross Domestic Product 1913 Prices (Billion Kronor)	Gross Domestic Product per Capita, 1913 Prices (Kronor)
	(1)	(2)	(3)	(4)	(5)
1. 1861-68	4.06	0.75	84.1	0.89	219
2. 1864-73	4.17	0.86	85.0	1.01	243
3. 1869-78	4.31	1.11	91.0	1.22	283
4. 1874-83	4.49	1.26	91.4	1.38	307
5. 1879-88	4.63	1.26	82.9	1.52	328
6. 1884-93	4.74	1.35	80.4	1.68	355
7. 1889-98	4.87	1.58	80.1	1.97	405
8. 1894-1903	5.05	1.95	82.6	2.36	468
9. 1899-1908	5.23	2.48	88.7	2.80	535
10. 1904-13	5.43	3.11	94.1	3.31	609
11. 1909-18	5.64	4.80	124.8	3.84	682
12. 1914-23	5.83	7.76	187.5	4.14	710
13. 1919-28	5.99	8.86	196.5	4.51	752
14. 1924-33	6.11	8.48	166.4	5.10	835
15. 1929-38	6.21	9.61	161.5	5.95	959
16. 1934-43	6.33	13.06	188.0	6.95	1098
17. 1939-48	6.56	19.37	229.9	8.42	1284
18. 1944-53	6.89	30.07	273.3	11.00	1596
19. 1950-54	7.12	40.07	305.4	13.12	1843

Appendix Table 9

B. Percentage Changes per Decade

Intervals	Population		Gross Domestic Product 1913 Prices		Gross Domestic Product per Capita 1913 Prices	
	Percent Change per Decade	7 Item Moving Average of Col. 1	Percent Change per Decade	7 Item Moving Average of Col. 3	Percent Change per Decade	7 Item Moving Average of Col. 5
	(1)	(2)	(3)	(4)	(5)	(6)
1861-68 to 1869-78	6.9		42.0		33.0	
1864-73 to 1874-83	7.7		36.6		26.3	
1869-78 to 1879-88	7.4	(6.6)	24.6	(30.9)	15.9	(22.9)
1874-83 to 1884-93	5.6	6.7	21.7	33.9	15.6	25.5
1879-88 to 1889-98	5.2	6.8	29.6	33.6	23.5	25.0
1884-93 to 1894-1903	6.5	6.8	40.5	33.7	31.8	25.2
1889-98 to 1899-1908	7.4	6.8	42.1	33.8	32.1	25.3
1894-1903 to 1904-13	7.5	6.9	40.3	33.2	30.1	24.6
1899-1908 to 1909-18	7.8	6.8	37.1	32.2	27.5	23.7
1904-13 to 1914-23	7.4	6.4	25.1	31.0	16.6	23.1
1909-18 to 1919-28	6.2	5.9	17.4	30.2	10.3	23.0
1914-23 to 1924-33	4.8	5.6	23.2	30.4	17.6	23.6
1919-28 to 1929-38	3.7	6.3	31.9	33.6	27.5	26.3
1924-33 to 1934-43	3.6	(5.0)	36.3	(38.6)	31.5	(31.5)
1929-38 to 1939-48	5.6		41.5		33.9	
1934-43 to 1950-54	12.5		60.1		46.8	

Notes to Appendix Table 9, Part A

Column 1

Averages of annual estimates given in Lindahl, Dahlgren, and Koch, National Income of Sweden, 1861-1930 (London, 1937), Part Two, Table 64, pp. 4-5 for 1861-1930, in Bunlé, op. cit., Table 1 for 1931-36, and in the U.N. Demographic Yearbook, 1952, Table 3 for 1937-40 and in ibid., 1954, Table 2 for 1941-54.

Column 2

Averages of annual estimates, which are unpublished revisions of those in Lindahl, Dahlgren, and Koch, op. cit., prepared by Olaf Lindahl for 1861-1951 and are extrapolated for 1952-54 by the series 'b' given in the U.N. Statistical Paper, Series H, No. 8, Table 1.

Column 3

Column 2 divided by column 4.

Column 4

Averages of annual estimates, which we have derived by adjusting the current price series by the cost of living index. The latter was supplied by Mr. Lindahl.

Column 5

Column 4 divided by column 1.

Appendix Table 10

Population and National Income, Total and Per Capita, Current and 1938 Prices, Italy, 1862-1954

A. Absolute Figures

	Population (millions)	National Income Current Prices (Billion lire)	Price Index (1938 = 100)	National Income 1938 Prices (Billion lire)	National Income per Capita 1938 Prices (lire)
	(1)	(2)	(3)	(4)	(5)
1. 1862-68	26.74	7.03	17.0	41.43	1549
2. 1864-73	27.36	7.87	18.3	42.98	1571
3. 1869-78	28.27	8.99	20.2	44.52	1575
4. 1874-83	29.22	9.26	20.7	44.78	1533
5. 1879-88	30.19	9.47	19.3	48.98	1622
6. 1884-93	31.20	10.11	18.9	53.47	1714
7. 1889-98	32.25	10.12	18.6	54.43	1688
8. 1894-1903	33.33	11.02	18.4	59.76	1793
9. 1899-1908	34.50	13.12	19.3	68.13	1975
10. 1904-13	35.94	16.03	20.5	78.10	2173
11. 1909-18	37.21	23.81	30.1	79.08	2125
12. 1914-23	37.76	63.01	73.8	85.39	2261
13. 1919-28	38.68	115.4	106.4	108.40	2802
14. 1924-33	40.28	119.6	99.6	120.02	2980
15. 1929-38	41.76	107.6	86.2	124.90	2991
16. 1934-43	43.34	154.0	118.0	130.53	3012
17. 1939-48	44.87	1,827.5	1,585.2	115.29	2569
18. 1944-53	46.47	6,022.4	4,593.4	131.11	2821
19. 1950-53	47.75	9,347.8	5,360.0	174.40	3652

Appendix Table 10

B. Percentage Changes per Decade

Intervals	Population		National Income 1938 Prices		National Income per Capita, 1938 Prices	
	Percent Change per Decade	7 Item Moving Average of Col. 1	Percent Change per Decade	7 Item Moving Average of Col. 3	Percent Change per Decade	7 Item Moving Average of Col. 5
	(1)	(2)	(3)	(4)	(5)	(6)
1862-68 to 1869-78	6.8		8.8		2.0	
1864-73 to 1874-83	6.8		4.2		-2.4	
1869-78 to 1879-88	6.8		10.0		3.0	
1874-83 to 1884-93	6.8		19.4		11.8	
1879-88 to 1889-98	6.8		11.1		4.1	
1884-93 to 1894-1903	6.8		11.8		4.6	
1889-98 to 1899-1908	7.0	(7.3)	25.2	(19.0)	17.0	(10.9)
1894-1903 to 1904-13	7.8	6.5	30.7	20.2	21.2	12.9
1899-1908 to 1909-18	7.9	6.5	16.1	24.4	7.6	16.9
1904-13 to 1914-23	5.1	6.6	9.3	24.9	4.0	17.2
1909-18 to 1919-28	4.0	6.7	37.1	22.5	31.9	14.9
1914-23 to 1924-33	6.7	6.7	40.6	17.1	31.8	9.9
1919-28 to 1929-38	8.0	6.6	15.2	18.2	6.7	11.0
1924-33 to 1934-43	7.6	(7.4)	8.8	(16.2)	1.1	(8.2)
1929-38 to 1939-48	7.4		-7.7		-14.1	
1934-43 to 1950-54	7.4		23.9		15.3	

Figures in parentheses are arithmetic means for the first and last groups of 5 items each.

Notes to Appendix Table 10, Part A

Columns 1, 2, and 4

Averages of annual estimates given in Benedetto Barberi, "The Economic Growth of Italy, 1862-1954," (mimeo. paper persented at the 1955 meeting of the International Association for Research in Income and Wealth, held at Hindsgavl, Denmark

Column 3

Column 2 divided by column 4.

Column 5

Column 4 divided by column 1.

Appendix Table 11

Population and National Income, Total and Per Capita, Current and 1929 Prices, Spain, 1906-1953

	Population (millions)	National Income Current Prices (Billion pesetas)	Price Index (1929 = 100)	National Income 1929 Prices (Billion pesetas)	National Income per Capita 1929 Prices (pesetas)
	(1)	(2)	(3)	(4)	(5)
1. 1906-13	19.8	9.97	58.6	17.01	859
2. 1909-18	20.4	13.25	73.4	18.06	886
3. 1914-23	21.1	20.11	101.6	19.81	938
4. 1919-28	22.0	23.65	108.8	21.73	987
5. 1924-33	23.1	23.78	101.3	23.47	1,015
6. 1929-35	23.9	24.46	98.6	24.82	1,038
7. 1939-48	26.5	66.77	286.4	23.31	880
8. 1944-53	27.6	147.13	534.3	27.54	1,000
9. 1949-53	28.1	204.74	676.2	30.28	1,078

Column 1

Averages of annual estimates given in Bunlé, op. cit., Table 1 for 1906-36, in the U.N. Demographic Yearbook, 1952, Table 3 for 1939, and in ibid., 1954, Table 2 for 1940-53.

Columns 2 and 4

Averages of annual estimates given in La Renta Nacional de España, Consejo de Economía Nacional (Madrid, 1945), pp. 110 and 112 for 1906-28 and in La Renta Nacional de España en 1953 (Madrid, 1954), p. 28 for 1929-35 and 1939-53.

Column 3

Column 2 divided by column 4.

Column 5

Column 4 divided by column 1.

Appendix Table 12

Population and Net National Product, Total and Per Capita, Current and 1938-39 Prices, Hungary, 1899-1949

	Population (millions)	Net National Product Current Prices[a]	Price Index (1938-39 = 100)	Net National Product 1938-39 Prices (Billion pengoes)	Net National Product per Capita, 1938-39 Prices (pengoes)
	(1)	(2)	(3)	(4)	(5)
1. 1899-1901	6.85	1.82		2.91	425
2. 1911-13	7.79	3.33		3.90	500
3. 1920/21	8.03	4.26[b]		3.30	411
4. 1924/25-1933/34	8.60	5.44	115.7	4.72	549
5. 1929/30-1938/39	8.89	5.22	99.1	5.26	592
6. 1934/35-1942/43	9.16	6.81	117.2	5.81	635
7. 1946/47	9.07	14.47[c]		3.60	397
8. 1947/48	9.13	19.86		4.73	518
9. 1949	9.21	28.30		5.89	640

[a]For pre-World War I years in billions of crowns, for inter-war years in billions of pengoes, for post-World War II years in billions of florins.

[b]In 1924/25 prices.

[c]In January 1947 prices.

Column 1

From Alexander Eckstein, "National Income and Capital Formation in Hungary, 1900-1950," Income and Wealth, Series V, Table III, p. 175, the entries for lines 4-6 being averages of annual estimates.

Column 2

From ibid., Table I, p. 165, the entries for lines 4-6 being averages of annual estimates.

Column 3

Column 2 divided by column 4.

Column 4

From ibid., Table II, p. 171, the entries for lines 4-6 being averages of annual estimates.

Column 5

Column 4 divided by column 1.

Appendix Table 13

Population and National Income, Total and Per Capita, 1900 Prices, European Russia and the U.S.S.R., 1870-1954

	Population (millions)	National Income 1900 Prices (Billion rubles)	National Income per Capita 1900 Prices (rubles)
	(1)	(2)	(3)
European Russia			
1. 1870	64.0	3.20	50.0
2. 1885	79.4	4.25	53.5
3. 1900	98.9	6.58	66.5
4. 1913	119.9	9.17	76.5
Interwar Territory of U.S.S.R.			
5. 1913	138.3	10.58	76.5
6. 1928	152.0	11.32	74.5
7. 1954	213.0	35.56	166.9

National Income excludes personal and government services.

Column 1

Lines 1-4: Column 2 divided by column 3.

Line 5: Average of estimates for the beginning of year given in S. N. Prokopovich, Der Vierte Fünf-Jahres Plan der Sowjetuniun, 1946-50, p. 18, and for the end of the year given in Planovoe Khoziaistuo 1934, No. 12, p. 201.

Line 6: Average of estimates for the beginning and end of year given in Statisticheskii Spravochnik, 1928, p. 1.

Line 7: Estimate for the beginning of the year given in the U.N. Survey of Europe, 1954, p. 66.

Column 2

Lines 1-4: From Raymond W. Goldsmith, "The Economic Growth of Russia, 1860-1913" (paper presented at the 1955 meeting of the International Association for Research in Income and Wealth, held in Hindsgavl Denmark), Table 17, p. 95.

Line 5: Column 1 multiplied by column 3.

Lines 6 & 7: Extrapolated from 1913 by means of average annual rates of growth, 1913-54 and 1928-54, supplied by Raymond W. Goldsmith.

Column 3

Lines 1-4: From Goldsmith, op. cit.

Line 5: Assumed the same as for European Russia (line 4).

Lines 6 & 7: Column 2 divided by column 1.

Appendix Table 14

Population and Gross and Net National Product, Total and Per Capita, Current and 1929 Prices, United States, 1869-1954

A. Absolute Figures

		Population (millions)	Net National Product Current Prices (Billion dollars)	Price Index Net National Product (1929 = 100)	Net National Product 1929 Prices (Billion dollars)	Gross National Product 1929 Prices (Billion dollars)	Gross National Product Inc. Gov't Serv. 1929 Prices (Billion dollars)	Net National Product per Capita 1929 Prices (dollars)	Gross National Product per Capita 1929 Prices (dollars)	Gross National Prod. Incl. Gov't Serv. per Capita 1929 Prices (dollars)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1.	1869-78	44.6	6.56	69.1	9.49	10.48	10.73	213	235	241
2.	1874-83	49.8	8.36	60.9	13.72	15.12	15.48	276	304	311
3.	1879-88	55.6	9.88	55.6	17.77	19.70	20.17	320	354	363
4.	1884-93	62.1	10.84	52.0	20.83	23.42	23.96	336	377	386
5.	1889-98	68.4	11.59	48.4	23.96	27.25	27.87	350	398	407
6.	1894-1903	74.7	14.50	48.3	30.02	33.97	34.80	402	455	466
7.	1899-1908	81.8	19.92	52.9	37.64	42.41	43.58	460	518	533
8.	1904-13	90.2	26.25	58.3	45.02	50.84	52.40	499	564	581
9.	1909-18	98.6	35.74	71.2	50.22	57.24	59.07	510	581	599
10.	1914-23	105.9	54.29	95.6	56.78	65.19	67.57	536	616	638
11.	1919-28	113.5	72.16	104.2	69.28	79.03	82.20	610	696	724
12.	1924-33	121.2	70.14	95.6	73.39	83.91	87.22	606	693	720
13.	1929-38	126.7	61.27	85.4	71.72	82.46	87.31	566	651	689
14.	1934-43	131.7	76.32	88.8	85.90	98.06	112.50	652	745	854
15.	1939-48	138.5	121.46	114.6	105.95	123.53	149.90	765	892	1,082
16.	1944-53	148.9	185.90	147.6	125.94	150.17	175.90	846	1,009	1,182
17.	1950-54	157.5	234.20	164.1	142.74	169.80	193.40	906	1,078	1,228

Notes to Appendix Table 14, Part A

Column 1

Averages of annual estimates given in Long-Term Estimates of National Income and Capital Formation, 1869-1953, a volume to be published by the National Bureau of Economic Research, for 1869-1953 and in the U.N. Demographic Yearbook, 1954, Table 2 for 1954.

Columns 2, 4 and 5

Lines 1-16: From Long-Term Estimates. . . .

Line 17: Average of annual estimates in ibid, for 1950-53, and extrapolated for 1954 by the series given in the U.N. Statistical Paper, Series H, No. 8, Table 1 for Column 2 and Table 2 for columns 4 and 5.

Column 3

Column 2 divided by column 4.

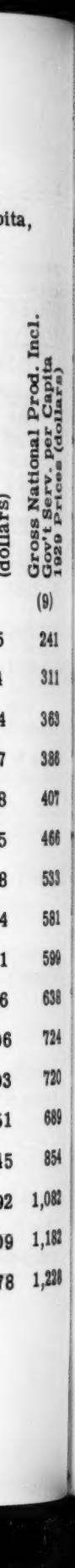
Column 6

Lines 1-13: Variant III of gross national product given in Long-Term Estimates . . .

Lines 14-17: Line 13 extrapolated by the constant price series for gross national product given in National Income, 1954 Edition (Dep't of Commerce, 1954), Table 40, p. 216 for 1929-53 and in the Survey of Current Business, February 1955, p. 8 for 1954.

Columns 7, 8 and 9

Columns 4, 5, and 6, respectively, divided by column 1.



Appendix

B. Percentage Cha

Intervals	Population		Net National Product 1929 Prices		Gross National Produc 1929 Prices	
	Percent Change per Decade	7 Item Moving Average of Col. 1	Percent Change per Decade	7 Item Moving Average of Col. 3	Percent Change per Decade	7 Item Moving Average of Col. 5
	(1)	(2)	(3)	(4)	(5)	(6)
1869-78 to 1879-88	24.7		87.2		88.0	
1874-83 to 1884-93	24.7		51.8		54.9	
1879-88 to 1889-98	23.0	(22.5)	34.8	(55.0)	38.3	(56.4)
1884-93 to 1894-1903	20.3	21.9	44.1	51.2	45.0	52.4
1889-98 to 1899-1908	19.6	20.9	57.1	42.5	55.6	43.8
1894-1903 to 1904-13	20.7	19.5	50.0	40.5	49.7	41.4
1899-1908 to 1909-18	20.5	18.3	33.4	39.7	35.0	40.0
1904-13 to 1914-23	17.4	17.0	26.1	33.9	28.2	34.2
1909-18 to 1919-28	15.1	15.5	38.0	28.2	38.1	28.7
1914-23 to 1924-33	14.4	13.9	29.3	27.9	28.7	28.7
1919-28 to 1929-38	11.6	13.0	3.5	29.6	4.3	30.9
1924-33 to 1934-43	8.7	(11.6)	17.0	(28.6)	16.9	(30.0)
1929-38 to 1939-48	9.3		47.7		49.8	
1934-43 to 1950-54	14.2		45.7		50.2	

Figures in parentheses are arithmetic means of the first and last groups of 5

Table 14

per Decade

Gross National Product Inc. Gov't Serv. 1929 Prices		Net National Product per Capita 1929 Prices		Gross National Product Incl. Gov't Serv. per Capita, 1929 Prices	
Percent Change per Decade	7 Item Moving Average of Col. 7	Percent Change per Decade	7 Item Moving Average of Col. 9	Percent Change per Decade	7 Item Moving Average of Col. 11
(7)	(8)	(9)	(10)	(11)	(12)
88.0		50.2		50.6	
54.8		21.7		24.1	
38.2	(56.5)	9.4	(26.5)	12.1	(27.7)
45.2	52.7	19.6	23.9	20.7	25.1
56.4	44.2	31.4	17.8	31.0	19.3
50.6	42.0	24.1	17.5	24.7	18.8
35.5	40.7	10.9	18.0	12.5	18.9
29.0	35.1	7.4	14.2	9.8	15.3
39.2	30.8	19.6	10.8	20.9	13.5
29.1	33.8	13.1	12.4	12.9	18.1
6.2	36.2	-7.2	14.8	-4.8	20.8
26.0	(37.0)	7.6	(15.3)	18.6	(22.9)
71.7		35.2		57.0	
52.0		27.6		30.9	

items each

Appendix Table 15

Population and Gross National Product, Total and Per Capita, 1935-39 Prices, Canada, 1870-1954

A. Absolute Figures

	Population (millions)	Gross National Product 1935-39 Prices (Billion dollars)	Gross National Product per Capita, 1935-39 Prices (dollars)
	(1)	(2)	(3)
1. 1870-79	3.96	0.78	198
2. 1875-84	4.26	1.01	237
3. 1880-89	4.54	1.25	276
4. 1885-94	4.79	1.42	295
5. 1890-99	5.04	1.58	313
6. 1895-1904	5.39	1.84	341
7. 1900-09	6.06	2.33	384
8. 1905-14	7.02	3.01	429
9. 1910-19	7.85	3.60	458
10. 1915-24	8.57	3.83	447
11. 1920-29	9.36	4.36	465
12. 1925-34	10.16	4.60	453
13. 1930-39	10.84	4.71	434
14. 1935-44	11.43	6.74	590
15. 1940-49	12.26	8.87	724
16. 1945-54	13.69	10.34	755
17. 1950-54	14.60	11.34	776

Appendix Table 15

B. Percentage Changes per Decade

Intervals	Population		Gross National Product 1935-39 Prices		Gross National Product per Capita, 1935-39 Prices	
	Percent Change per Decade	7 Item Moving Average of Col. 1	Percent Change per Decade	7 Item Moving Average of Col. 3	Percent Change per Decade	7 Item Moving Average of Col. 5
	(1)	(2)	(3)	(4)	(5)	(6)
1870-79 to 1880-89	14.6		60.3		39.4	
1875-84 to 1885-94	12.4		40.5		24.5	
1880-89 to 1890-99	11.0	(14.1)	26.4	(40.9)	13.4	(23.1)
1885-94 to 1895-1904	12.5	18.6	29.6	46.1	15.6	23.0
1890-99 to 1900-09	20.2	19.7	47.5	41.3	22.7	17.9
1895-1904 to 1905-14	30.2	20.7	63.6	38.6	25.8	14.6
1900-09 to 1910-19	29.5	21.8	54.5	37.7	19.3	12.9
1905-14 to 1915-24	22.1	22.2	27.2	34.6	4.2	9.7
1910-19 to 1920-29	19.2	21.1	21.1	34.4	1.5	10.8
1915-24 to 1925-34	18.6	18.7	20.1	38.0	1.3	16.7
1920-29 to 1930-39	15.8	17.6	8.0	37.5	-6.7	17.4
1925-34 to 1935-44	12.5	(16.3)	46.5	(42.9)	30.2	(23.2)
1930-39 to 1940-49	13.1		88.3		66.8	
1935-44 to 1950-54	21.6		51.6		24.5	

Figures in parentheses are arithmetic means of the first and last groups of 5 items each.

Notes to Appendix Table 15, Part A

Column 1

Lines 1-15: Averages of estimates for five-year periods given in O. J. Firestone, "Canada's Economic Development, 1867-1952," (revision of paper presented at the 1953 meeting of the International Association for Research in Income and Wealth, held at Castelgandolfo, Italy).

Line 16: Average of estimate for 1945-49 given in ibid., and for 1950-54 for which see the note to line 17.

Line 17: Weighted average of estimate for 1950-53 given in ibid. and estimate for 1954, given in the U.N. Demographic Yearbook, 1954, Table 2.

Column 2

Lines 1-16: See notes to column 1, lines 1-16.

Line 17: The average for 1950-53 given in Firestone, op. cit., adjusted to 1950-54 by the series given in the U.N. Statistical Paper, Series H, No. 8, Table 2.

Column 3

Column 2 divided by column 1.

Appendix Table 16

Population and National Income, Total and Per Capita, Current and 1929 Prices, Union of South Africa, 1911/12-1952/53

	Population (millions)	National Income Current Prices (Billion pounds)	Price Index (1929 = 100)	National Income 1929 Prices (Billion pounds)	National Income per Capita 1929 Prices (pounds)
	(1)	(2)	(3)	(4)	(5)
1. 1911/12	5.99	0.118	82.5	0.143	23.9
2. 1917/18-1923/24	6.97	0.185	106.2	0.174	25.0
3. 1919/20-1928/29	7.50	0.211	102.0	0.207	27.6
4. 1924/25-1933/34	8.37	0.226	92.2	0.246	29.3
5. 1929/30-1938/39	9.25	0.274	87.4	0.313	33.9
6. 1934/35-1943/44	10.17	0.406	96.2	0.422	41.5
7. 1939/40-1948/49	11.12	0.598	116.1	0.516	46.4
8. 1944/45-1952/53	12.08	0.887	142.1	0.624	51.7
9. 1949/50-1952/53	12.68	1.109	157.6	0.704	55.5

Column 1

Averages of annual estimates given for 1911/12, 1917-21, 1929-39 in various issues of the Offical Yearbook of the Union of South Africa, for 1925 and 1940-54 in the U.N. Demographic Yearbook, 1954, Table 2, and interpolated along a straight line for 1922-24 and 1926-28.

Column 2

Averages of annual estimates given for 1911/12-1951/52 in D. G. Franzsen, "National Accounts and National Income in the Union of South Africa since 1933," South African Journal of Economics, March 1954, Table I. For 1911/12-1936/37 the estimates were corrected for foreign income flows by reducing the totals by a factor ranging from 10 percent in the first year to 8.5 percent in the last year (1936/37) before specific data became available. For 1952/53 the 1951/52 figure was extrapolated by the series given in the U.N. Statistical Paper, Series H, No. 8, Table 1.

Column 3

Column 2 divided by column 4.

Column 4

Averages of annual estimates derived for 1911/12-1951/52 by deflating the current price series and for 1952/53 by extrapolating the 1951/52 figure by the series given in ibid;, Table 2. The price index used for deflation was that implicit in the estimates shown for 1911/12, 1919/20, 1922/23, 1928/29, 1932/33 and 1938/39 in S. H. Frankel, "An Analysis of the Growth of the National Income of the Union in the Period of Prosperity before the War," South African Journal of Economics, June 1944, Table 1 and interpolated and extrapolated for other years by the cost of living index given in the Official Yearbook of the Union of South Africa.

Column 5

Column 4 divided by column 1.

Appendix Table 17

Population and National Income, Total and Per Capita, Current and 1928-32 Prices, Japan, 1878-1954

A. Absolute Figures

	Population (millions)	National Income Current Prices (Billion yen)	Price Index (1928-32 = 100)	National Income 1928-32 Prices (Billion yen)	National Income per Capita 1928-32 Prices (yen)
	(1)	(2)	(3)	(4)	(5)
1. 1878-87	37.2	0.63	39.5	1.60	43.0
2. 1883-92	39.3	0.70	35.6	1.96	50.0
3. 1888-97	41.2	0.99	39.9	2.49	60.6
4. 1893-1902	43.3	1.56	48.2	3.23	74.6
5. 1898-1907	46.1	2.20	58.7	3.75	81.5
6. 1903-12	48.9	2.90	66.6	4.35	88.9
7. 1908-17	52.2	3.91	75.5	5.18	99.3
8. 1913-22	55.2	7.85	124.2	6.32	114.4
9. 1918-27	58.0	11.89	147.1	8.08	139.3
10. 1923-32	61.8	12.22	115.4	10.58	171.2
11. 1928-37	66.4	13.77	103.3	13.33	200.6
12. 1933-42	70.1	23.88	148.4	16.09	229.6
13. 1938-47[a]	73.0	202.2	1315.7	15.37	210.7
14. 1943-52	78.8	2033.9	14,433.3	14.09	178.9
15. 1950-54	85.5	5235.5	28,131.1	18.61	217.6

[a]No income data available for 1945.

Appendix Table 17

B. Percentage Changes for Decade

Intervals	Population		National Income 1928-32 Prices		National Income per Capita, 1928-32 Prices		National Income per Capita 1928-32 Prices (yen)
	Percent Change per Decade	7 Item Moving Average of Col. 1	Percent Change per Decade	7 Item Moving Average of Col. 3	Percent Change per Decade	7 Item Moving Average of Col. 5	
	(1)	(2)	(3)	(4)	(5)	(6)	(5)
1878-87 to 1888-97	10.8		55.6		40.9		43.0
1883-92 to 1893-1902	10.2		64.8		49.2		50.0
1888-97 to 1898-1907	11.9	(11.8)	50.6	(48.8)	34.5	(33.1)	60.6
1893-1902 to 1903-12	12.9	11.9	34.7	49.3	19.2	33.5	74.6
1898-1907 to 1908-17	13.2	12.0	38.1	51.0	21.8	34.8	81.5
1903-12 to 1913-22	12.9	12.6	45.3	51.0	28.7	34.0	88.9
1908-17 to 1918-27	11.1	12.9	56.0	51.2	40.3	34.0	99.3
1913-22 to 1923-32	12.0	12.4	67.4	48.5	49.6	31.9	114.4
1918-27 to 1928-37	14.5	12.6	65.0	44.5	44.0	28.3	139.3
1923-32 to 1933-42	13.4	(12.9)	52.1	(42.1)	34.1	(25.8)	171.2
1928-37 to 1938-47	9.9		15.3		5.0		200.6
1933-42 to 1950-54	14.7		10.6		-3.6		229.6
							210.7
							178.9
							217.6

Figures in parentheses are arithmetic means of the first and last groups of 5 items each.

Notes to Appendix Table 17, Part A

Column 1

Averages of annual estimates given for 1878-1900 in Statistique Internationale du Mouvement de la Population, vol. 1, p. 50; for 1901-05 in ibid., vol. 2, p. 24; for 1906-36 in Bunlé, op. cit., Table 1; for 1937-39 in the U.N. Demographic Yearbook 1952, Table 3, and for 1940-54 in ibid., Table 2.

Column 2

Averages of 5-year averages given for 1878-82 to 1938-42 in Yuzo Yamada, "Notes on Income Growth and the Rate of Svvings in Japan," Income and Wealth, Series V, Table VII, p. 231 and extrapolated from 1938-42 by the series given in the U.N. Statsitical Paper, Series H, No. 8, Table 1.

Column 3

Column 2 divided by column 4.

Column 4

Averages of 5-year averages given for 1878-82 to 1938-42 in Yamada, op. cit., Table VII, p. 231 and extrapolated from 1938-42 by the series given in the U.N. Statistical Paper, Series H, No. 8, Table 2.

Column 5

Column 4 divided by column 1.

Appendix Table 18

Population and National Income, Total and Per Capita, Constant Prices, Australia, 1886-1953/54

	Population (millions)	National Income Constant Prices (Billion I.U.)	National Income per Capita Constant Prices (I.U.)
	(1)	(2)	(3)
1. 1886-94	3.11	1.34	432
2. 1898-1903	3.78	1.59	421
3. 1913/14	4.88	2.25	461
4. 1914/15-1923/24	5.26	2.12	404
5. 1919/20-1928/29	5.82	2.84	489
6. 1924/25-1933/34	6.33	3.24	512
7. 1929/30-1938/39	6.68	3.46	518
8. 1934/35-1943/44	6.98	4.16	597
9. 1939/40-1948/49	7.35	4.70	640
10. 1944/45-1953/54	8.03	5.25	653
11. 1949/50-1953/54	8.51	5.69	668

Column 1

Averages of annual estmiates given for 1886-94 and 1898-1903 in Statistique Internationale du Mouvement de la Population, vol. 1, pp. 51-56, for 1913-36 in Bunlé, op. cit., Table 1, for 1937-39 in the U.N. Demographic Yearbook, 1952, Table 3, and for 1940-54 in ibid., 1954, Table 2.

Column 2

Lines 1 and 2: Column 1 multiplied by column 3.

Lines 3-11: Averages of annual estimates given for 1913/14-1947/48 in Clark, op. cit., p. 140 and extrapolated from 1947/48 by an index derived by adjusting the series given in the U.N. Statistical Paper, Series H, No. 8, Table 1 by the cost of living index given in the Yearbook of the Commonwealth of Australia, various issues.

Column 3

Line 1: Extrapolated from 1901-03 (given in Clark, op. cit.) with national product per man-year as index. The latter is an average of 1886, 1887, 1890, 1892, and 1894 as given in Clark, op. cit., p. 140.

Line 2: Extrapolated from 1901-03 by the series described in the note to line 1. Here the figure is an average of those for 1898 and 1901-03.

Lines 3-11: Column 2 divided by column 1.

Appendix Table 19

Population and National Income, Total and Per Capita, Constant Prices, New Zealand, 1901-1953/54

	Population (millions)	National Income Constant Prices (Billion I.U.)	National Income per Capita Constant Prices (I.U.)
	(1)	(2)	(3)
1. 1901	0.78	0.44	567
2. 1925/26-1933/34	1.40	0.87	619
3. 1929/30-1938/39	1.47	1.01	690
4. 1934/35-1943/44	1.52	1.16	766
5. 1939/40-1948/49	1.59	1.31	824
6. 1944/45-1953/54	1.74	1.63	936
7. 1949/50-1953/54	1.84	1.83	995

Column 1

Average of annual estimates given for 1901 in Statistique Internationale du Mouvement de la Population, vol. 1, p. 57; for 1925-36 in Bunlé, op. cit., Table 1; for 1937-39 in the U.N. Demographic Yearbook, 1952, Table 3; and for 1940-53 in ibid., 1954, Table 2. The estimates exclude the Maioris.

Column 2

Averages of annual estimates given for 1901 and 1925/26-1947/48 in Clark, op. cit., p. 148 and extrapolated from 1947-48 by an index derived by adjusting the series given in the U.N. Statistical Paper, Series H, No. 8, Table 1 by the cost of living index given in the Official Yearbook of New Zealand, various issues.

Column 3

Column 2 divided by column 1.

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